LIVING CLOSE TO THE LEDGE

LIVING CLOSE TO THE LEDGE:
PREHISTORY AND HUMAN ECOLOGY OF THE BLISS ISLANDS, QUODDY REGION, NEW BRUNSWICK, CANADA

by

DAVID W. BLACK, B.A., M.A.

A dissertation

Submitted to the School of Graduate Studies

in Partial Fulfillment of the Requirements

for the Degree

Doctor of Philosophy

McMaster University

1989

DOCTOR OF PHILOSOPHY (1989) McMASTER UNIVERSITY

(Anthropology) Hamilton, Ontario

TITLE: Living Close to the Ledge: Prehistory and Human Ecology of the Bliss Islands, Quoddy Region, New Brunswick, Canada.

AUTHOR: David W. Black, B.A. (Simon Fraser University), M.A. (McMaster University)

SUPERVISOR: Peter G. Ramsden, Ph.D.

NUMBER OF PAGES: xxvi, 512

McMASTER UNIVERSITY LIBRARY

FOREWORDS

"Pesmocady, surviving as Passamaquoddy, is a Micmac Indian word meaning 'pollock getting place'... The harbour described by the author is clearly the original Passamaquoddy, between Campobello and Deer Island, not the large bay to which the name has been transferred" (W.F. Ganong from The Cadillac Memoir of 1692).

"Archaeological strata... are unique deposits in time, space and composition... archaeological stratification may exist without artifacts" (E.C. Harris from The Laws of Archaeological Stratigraphy).

"he who calls what has vanished back again,
enjoys a bliss like that of creating"
(B.G. Niebuhr from History of Rome).

"Close to the edge
Down by the water...
Seasons will pass us by..."
(Jon Anderson from Yessongs).

FRONTPIECE: Murphy's Ledge.

ABSTRACT

Living Close to the Ledge:

Prehistory and Human Ecology of the Bliss Islands,

Quoddy Region, New Brunswick, Canada.

by David W. Black

Six prehistoric archaeological sites on the Bliss Islands are analyzed with the aim of developing an account of the prehistory and human ecology of the insular Quoddy region of southern New Brunswick, Canada. The Bliss Islands sites are shown to conform to general patterns of chronology, site typology, location, and structure for prehistoric sites in the region and to be representative of the Quoddy region prehistoric site inventory. Thus, the Bliss Islands are treated as a microcosm of the insular Quoddy region.

The cultural history of the islands is approached through a comparison of the two largest sites. Evidence from the Weir site, a large, deep, complexly but distinctly stratified, and undisturbed midden, is used to 'stratify' the contents of the Camp site, a shallow, but extensive shell midden disturbed by historic activity and natural pedogenic processes. The evidence suggests that, while both of these sites were occupied from the later part

of the Early Maritime Woodland period through the early part of the Late Maritime Woodland period (ca. 2400bp--ca. 1100bp), they were functionally differentiated. Weir functioned mainly as a marine resource exploitation and processing site, while Camp functioned as a generalized habitation area. In addition to the Maritime Woodland components, the Camp site contains occupations dating to the protohistoric and historic periods (ca. 450bp--present). The four smaller sites on the Bliss Islands represent short term occupations relating to the Late Maritime Woodland and protohistoric occupations at Camp and Weir. The artifact assemblages recovered from the six sites indicate that significant changes in technology occurred in the Quoddy region during the Maritime Woodland period.

The prehistoric human ecology of the islands is investigated through two related phenomena: subsistence and seasonality. Subsistence practices are explored through niche width analysis of each of the analytical units defined, and through isotopic analyses of encrustations on ceramic sherds. Seasonality is explored through ethnohistoric and natural history information, and growth increment analyses of shellfish and mammal teeth. The evidence indicates that the Bliss Islands faunal assemblages represent a relatively specialized subsistence orientation, and that significant changes in subsistence and settlement patterns occurred in the Quoddy region during the Maritime Woodland period. The model of a relatively stable and generalized prehistoric adaptation to the Quoddy region, spanning the period from 2200bp to the historic period, is challenged; while this model may be accurate for the Late Maritime Woodland period, it does not reflect evidence from the Early and Middle Maritime Woodland periods.

From a methodological point-of-view, two conclusions are stressed. First, the information gained from undisturbed and intact sites is crucial in developing local and regional cultural history models. This study suggests that 'stratifying' the contents of disturbed Northeastern shell middens on the basis of 'imported' culture history models is, at best, potentially misleading. Second, the application of biological models, such as the niche width measurement used in this study, has the potential to substantially revise interpretations of Northeastern prehistoric human ecology. In the Bliss Islands case, this model substantiates the expectation, based on general ecological theory, that subsistence adaptations to highly productive and dynamic environments, such as that of the Quoddy region, will be relatively specialized rather than generalized.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

Blank page inserted to maintain continuity.

PART I (context)

Blank page inserted to maintain continuity.

PREFACE AND ACKNOWLEDGEMENTS.

"...not the most important, but... the stuff of background, the material of understanding, the real power of history" (David Bradley, in The Chaneysville Incident).

Preface:

The archaeology of the Bliss Islands has been my chief professional obsession since that fateful day early in 1983 when, as I sat looking at maps in the lab at Archaeological Services in Fredericton, the location of the islands and the distribution of prehistoric sites on them first sparked my interest. That interest became fascination a month later when I first steered a boat into Fishermans Cove, landed it below Tommy Mitchell's camp, and studied the edge of the Camp site eroding into the intertidal zone. The next day fascination was transformed into a combination of wonder and obsession, as I poked through the brambles covering the surface of the Weir site, and began to form an impression of the archaeological potential which that site holds.

The Bliss Islands Archaeology Project has been a quest, not only into the past, but into means of inferring the past. The best moments of both the field work and the analytical work have been played out in a pleasantly picaresque style, and the most exhilarating at the speed of a runaway roller-coaster. In this account of the project, I have attempted to maintain a balance between the polarities inherent in scientific research: data and interpretation, induction and deduction, innovation and tradition, time's arrow and time's cycle.

Other people's obsessions are not easy to live with. My family has always at least tolerated, and usually actively supported, my obsessions with the past. My friends and colleagues have done the same. I doubt that it is possible for me to repay the debts I have incurred during this research; in the sections below I have made an attempt to at least acknowledge those debts.

Acknowledgements:

Although the responsibility for the interpretations of Quoddy region prehistory and human ecology presented here is solely my own, research projects and written works of this length and complexity are inevitably the result of a fusion of the efforts and thoughts of a great number of individuals. I have attempted below to thank all of the archaeologists and others who have contributed, directly and indirectly, to the Bliss Islands Archaeology Project, and to this dissertation.

I must express my gratitude to the institutions listed below for their assistance and support:

1. Archaeological Services of New Brunswick, Provincial Parks and Historic Sites Branch, Department of Tourism, Recreation

and Heritage provided funding and equipment for the field work;

2. the School of Graduate Studies, McMaster University, provided funding for field work, analytical and conference expenses;
3. the Social Sciences and Humanities Research Council of Canada provided funding through a Doctoral Fellowship;
4. the Department of Anthropology, St. Mary's University, co-operated with the project through its archaeological field school program;
5. the Charlotte County School Board provided lab space in the Back Bay Elementary School;
6. Connor's Bros. Ltd., Black's Harbour, gave permission to conduct field work on their portion of the islands;
7. the Department of Anthropology, McMaster University, provided lab space and analytical equipment;
8. the Faunal Osteoarchaeology Lab, Dept. of Anthropology, University of Toronto facilitated the faunal analyses.

The research could not have been conducted successfully without the assistance, hospitality, co-operation, and friendship of the persons listed below:

9. in Charlotte County: Tony Cook, Arthur Leslie, Frances Mitchell, Richard Mitchell, Samuel Mitchell, Thomas Mitchell, Weldon Mitchell, Eugene Simpson, Jim Tubbs;

10. in Fredericton: Patricia Allen, Albert Ferguson, Scott Finley, Louise Hale, Linda Jefferson, Marc Lavoie, Nick Paul, Joan Peterson, Chris Turnbull;
11. at St. Mary's University: Stephen Davis, Michael Deal;
12. at the Nova Scotia Museum: Dr. Derek S. Davis, Ruth Holmes Whitehead, B. Wright;
13. St. Mary's field school students: Susan Crowe, Peter Donkin, Charles Keeler, James MacPhee, Valery Monahan, Colin Warman, Ruth Whitehead;
14. volunteer field workers: Ellen Cameron, Stuart Dalton, Joanna Davidson, Ellen Foulkes, Sam Gallagher, Gary Gerson, Dan Horsman, Kevin Robins, Emelie Seheult;
15. at McMaster University: Drs. David R. Counts, David J. Damas, Emöke J.E. Szathmary (Anthropology); June Morton (Geology); Drs. B. John, W.J. Slater (Graduate Studies);
16. undergraduate students at McMaster who have contributed their time and effort to analyses of the Bliss Islands material: Emmy Arnold, Brad Bandow, Julie Galbraith, Art Flach, Tamara Grottker, David Johnston, Pamela Kaufman, Jamie Malcolm, Connie O'Shaughnessy, Becky Southern, Judith Stewart, Jan Walli, Deirdre Ward;
17. for their assistance with the drafting of figures: Angel Gomez Miguelenez, Debra Novosad;

****

LIVING CLOSE TO THE LEDGE

18. for their assistance with the photographic record: Scott Finley, Louise Hale, Chris Turnbull;

19. for their assistance with computing and data processing: Delia Gerner, Gordon Guyatt, Rosita Jordan, Jana Keller;

20. at the University of Toronto: Kathy Gruspier, Dr. Howard G. Savage;

21. at the Royal Ontario Museum: Dr. Dale R. Calder, Barbarann Ruddell (Invertebrate Zoology); Dr. E. Crossman, Marty Rouse (Ichthyology); Kevin Seymour (Vertebrate Paleontology);

22. in Maine: Drs. Bruce Bourque (Maine State Museum), David Sanger (University of Maine at Orono), Art Spiess (Maine Historic Preservation Commission);

I must extend my thanks to the members of my supervisory committee at McMaster, Drs. Peter G. Ramsden, Laura Finsten, and Henry P. Schwarcz for their assistance and constructive criticism, and to Drs. R.L. Gentilcore, J. Kolasa and G.W. Torrance for their participation at my dissertation defence. Dr. Stephen L. Cumbaa (Zooarchaeological Identification Center, Ottawa), the external examiner of the dissertation, provided many valuable editorial and substantive comments on the defence draft.

For their help with maintaining reasonable perspectives on the graduate school process and on my research, I must thank my fellow graduate students at McMaster, especially Hugh Daechsel, Wayne Fife, Diana Gordon, John MacDonald, Angele Smith, Becky

Southern, Rick Sutton, John Switzer, Jan Walli, and Phil Woodley. I owe an especially great debt to Peter Ramsden, supervisor, critic, mentor, and friend, who has seen me through all of this and managed to retain his sense of humour.

Dedication:

This dissertation is dedicated to the memory of my father, Walter J. Black (1913-1985), who always listened to my stories of the past--and told me a few of his own, and to the promise of my son, Neal Andrew (1988-), who accompanied me at the word processor during much of this writing.

****
LIVING CLOSE TO THE LEDGE

CHAPTER 1:

INTRODUCTION TO THE INSULAR QUODDY REGION AND THE STUDY.

"Trying to unweave, unwind, unravel,
And piece together the past..."
(T.S. Eliot, The Dry Sauvages)

Eliot could not have written a more accurate and concise description of the process of prehistoric archaeological research if that had been his intention. The material culture of the past is 'unwoven' from the context in which it is found, the earth, and 'pieced together' to form a different context, prehistory. The present study is an attempt, on my part, to 'unweave, unwind' and 'unravel' several coastal archaeological sites on the Bliss Islands, and to 'piece together the [prehistoric] past' of the insular Quoddy region over a period of some 2000 years. My emphasis here is on two of the strands which intertwine to compose the pattern of human history: cultural history, and human ecology.

For the purposes of this study, I define cultural history as the description and dating of artifactual assemblages which are inferred to correspond to social groups present in the past, and attempts to account for changes in these material culture assemblages over time. I define human ecology as the study of human interaction with the landscape (cf. Butzer 1982:xi), and, in this study, my approach is restricted to detailing the choices which the aboriginal people of the insular Quoddy region made in the past with respect to locating their settlements and procuring their subsistence needs.

In the balance of this first chapter I introduce the Quoddy region, summarize the ethnohistory of the region, and survey previous archaeological research conducted in the region. Against this background, I describe the research strategy adopted in this dissertation to investigate the prehistoric cultural history and human ecology of the insular Quoddy region.

Geographic and temporal scope of the study:

The Quoddy region is situated at the confluence of two extensive and dynamic marine systems, the Gulf of Maine and the Bay of Fundy, on the Northeast coast of North America (Figure 1-1). It is part of an ecological and cultural area known as the Maine/Maritimes area (e.g. Sanger 1974), which includes the coastal drainages of Maine, southern New Brunswick and southwestern Nova Scotia.

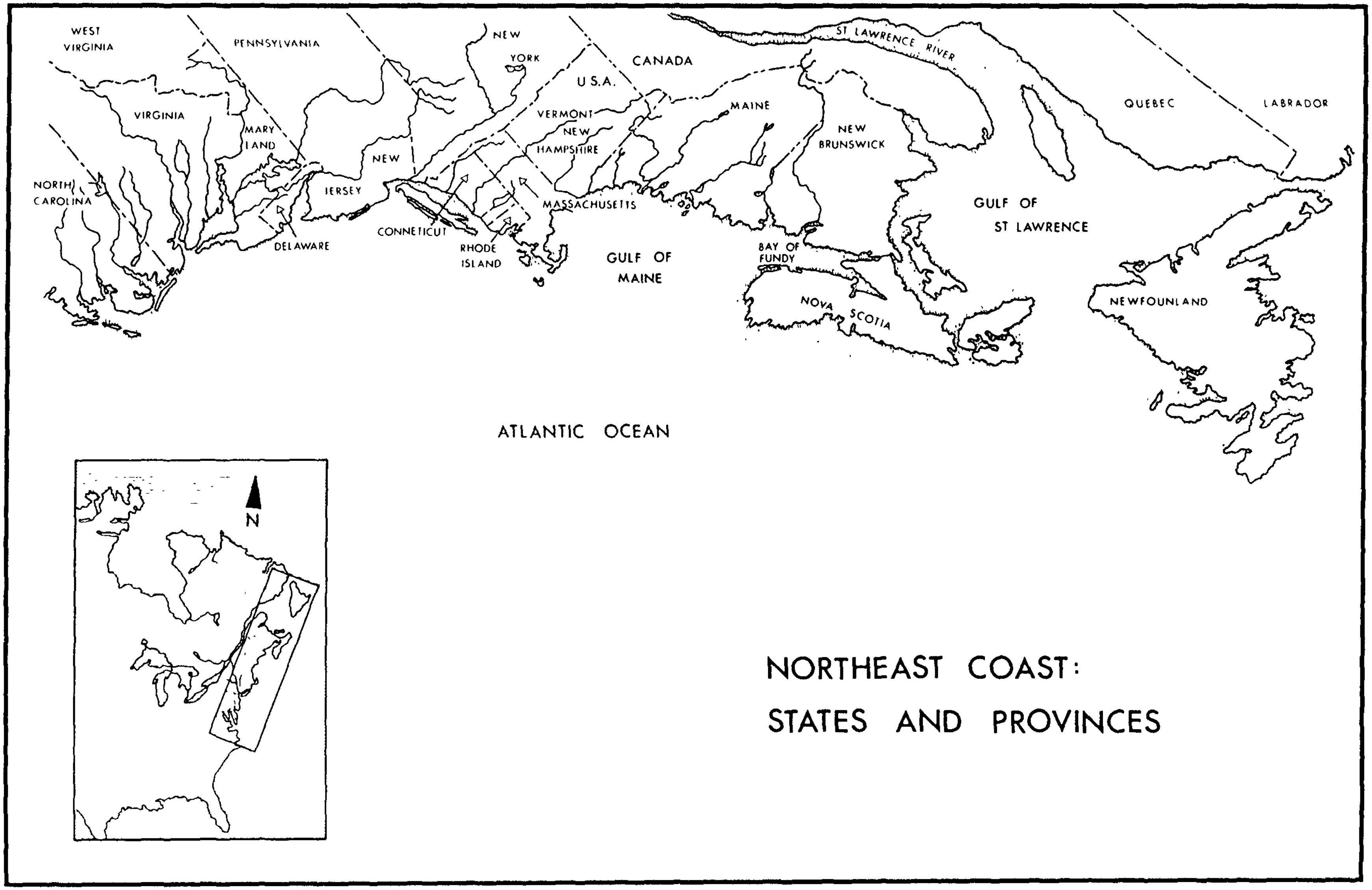
The Quoddy region is a biogeographically defined (Thomas 1983a:1) marine and coastal region including portions of southern New Brunswick and northern Maine, and stretching from the head of tide on the St. Croix river (at St. Stephen) to the marine boundaries shown on Figure 1-2. The region includes a number of geographic subareas, the St. Croix river estuary, Passamaquoddy

Bay, Cobscook Bay, the West Isles, the Wolves, and the marine waters bounded by West Quoddy Head, the northern tip of Grand Manan, and Point Lepreau.

The present study is restricted, in general, to the Canadian portion of the Quoddy region, and, specifically, to the insular portions of the region, virtually all of which are on the Canadian side of the international boundary. The Grand Manan archipelago is not part of the biogeographic region; however, for the purposes of archaeological research it will be included in the insular Quoddy region (Black 1984a). The study region includes some 820km of shoreline, and a land and sea area of ca. 3000km2.

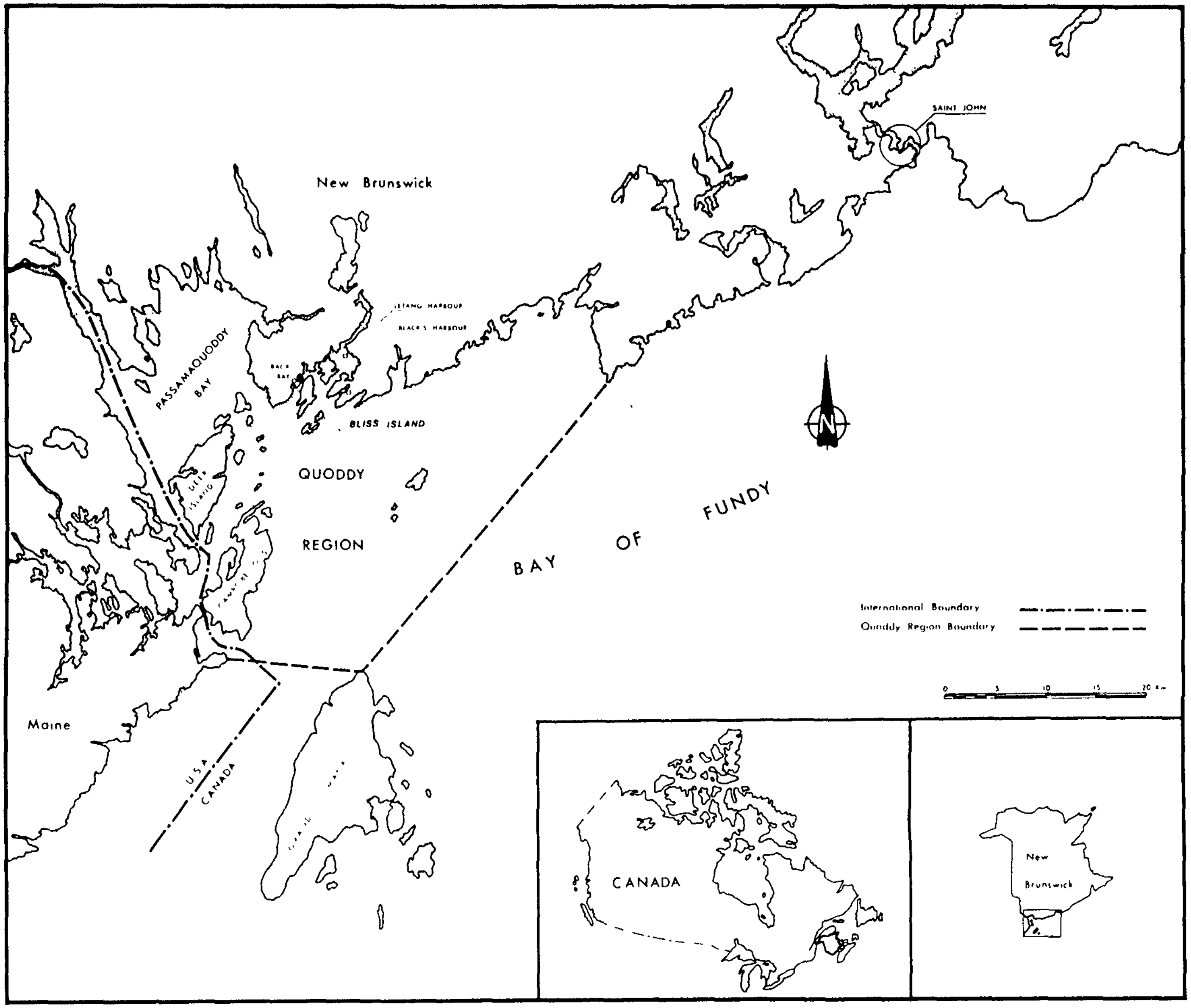
The Maritime Provinces have been occupied by humans for at least the past 10,000 years (Davis and Christianson 1988; Keenlyside 1984; Turnbull and Allen 1988). However, the most visible archaeological remains in the region have probably always been coastal, and, thus, extremely sensitive to the vagaries of changing sea levels. Since about 5000 years ago there has been a trend for sea levels to rise sharply in relation to the land in the southern Maritimes (Fladmark 1983:71-73). Both tectonic factors and increasing tidal amplitudes in the Bay of Fundy have played parts in this trend (Grant 1970; Turnbull 1988). As a result, coastal archaeological remains older than about 2500bp are drowned or eroded away.1 Consequently, the temporal scope of this study is restricted to the time period from ca. 2500bp to ca.

FIGURE 1-1: The Northeast coast showing the location of the Quoddy region.



WEST VIRGINIA
PENNSYLVANIA
NEW YORK
CANADA
U.S.A.
ST LAWRENCE RIVER
QUEBEC
LABRADOR
VIRGINIA
MARYLAND
NEW JERSEY
VERMONT
NEW HAMPSHIRE
MAINE
NEW BRUNSWICK
NORTH CAROLINA
DELAWARE
CONNETICUT
RHODE ISLAND
MASSACHUSETTS
GULF OF MAINE
BAY OF FUNDY
NOVA SCOTIA
GULF OF ST LAWRENCE
NEWFOUNLAND
ATLANTIC OCEAN
N
NORTHEAST COAST:
STATES AND PROVINCES

FIGURE 1-2: Map of the Quoddy region showing the location of the Bliss Islands and other place names in the region.



New Brunswick
SAINT JOHN
LETANG HARBOUR
BLACK'S HARBOUR
BACK BAY
BLISS ISLAND
PASSAMAQUODDY BAY
DEER ISLAND
QUODDY REGION
BAY OF FUNDY
N
International Boundary
Quoddy Region Boundary
0 5 10 15 20 Km
Maine
USA
CANADA
CANADA
New Brunswick

350bp (the latter date marking the beginning of significant European activity in the region).

Description of the Quoddy region:

The Quoddy region is located adjacent to the Bay of Fundy which has the highest tides in the world (up to 20m). Tides in the region itself range from 5-8m, and result in an enormous exchange of water between the Quoddy region and the Bay of Fundy and Gulf of Maine systems each day. One result of the tidal regime has been the development of a coastal ecotone consisting of a complex patchwork of coastal forests, salt marshes, intertidal zones, estuaries, coves and channels. This ecotone presents enormous potential for modern human exploitation, and, although it has certainly changed in detail, it has probably presented a similar potential throughout the period considered in this study (Sanger 1987:11-13).

The Quoddy region has been extensively studied by natural scientists and an excellent literature on the geography, biology and ecology of the region exists. Much of the natural history and ecological information relevant to archaeological research in the region has previously been summarized in the archaeological literature (see, for example, Black 1983, 1985a; Bonnichsen and Sanger 1977; Crotts 1984; Davis 1978; McCormick 1980; Sanger 1983, 1985a, 1986, 1988; Stewart 1974; Turnbull 1988). Thus, although I have drawn upon the natural sciences literature in my interpretations, I have not summarized this extensive body of material in this study. The most important sources are briefly discussed in the balance of this section.

The hard rock geology of the Quoddy region has been described by Cumming (1967) and Ruitenberg (1968), the surficial geology and glacial chronology by Rampton et al. (1984). The meteorology of the region is summarized by (Thomas 1983b), and the physical oceanography by Trites and Garrett (1983). Paleoenvironmental research relevant to the region is discussed by Bousfield and Thomas (1975), Mott (1974), Sanger (1979b, 1985a, 1988) and Turnbull (1988).

Of particular relevance to the present study are models of past sea levels. Sanger (1985a:14, 1988) notes that in other parts of the world there is a correlation between the slowing of sea level rise and the development of large coastal middens. Sanger (1984, 1985a) postulates that the large middens in the Quoddy region may indicate a period of rapid sea level rise to ca. 2500bp, followed by a period of stable sea levels, followed by another period of relatively rapid sea level rise to the present. There is corroborating geological evidence for this scenario, although the development of the modern tidal regime in the Bay of Fundy is currently a controversial geological issue (see Turnbull 1988:94-96). Sanger's model of punctuated sea level rise would explain anomalies like those revealed by my (Black 1983:37-41) reconstructions of Partridge Island shorelines using Grant's (1970) average rate-of-rise model.

Marine zoology has received the bulk of attention by natural scientists working in the region. Thomas (1983a) has recently published an edited volume containing papers on many aspects of the biogeography and ecology of the region, but emphasising marine zoology, ecology and biostratigraphy. The papers describing biostratigraphy on hard substrates (Thomas et al. 1983; Logan et al. 1983) and sedimentary substrates (Steele 1983; Wildish 1983) are especially useful for understanding the natural parameters governing human exploitation of inshore marine resources. In addition, a series of volumes inventorying marine resources in the region has been produced by MacKay et al. (1978). They present estimates of overall marine productivity, and indicate that the northern West Isles and Back Bay shelf are the most highly productive subregions.

Hinds (1988) and Thomas (1983c) describe the natural terrestrial vegetation of the region. Marine intertidal vegetation is covered by South (1981).

Terrestrial mammals common in the region are discussed by Dilworth (1984). Avian wildlife is discussed by Squires (1952, 1976) and Christie (1983). Marine mammals are described by Gaskin (1983) and Banfield (1974). Fish are discussed by Liem and Scott

(1966), Scott (1983), and Scott and Scott (1988), and marine invertebrates by Brinkhurst et al. (1975).

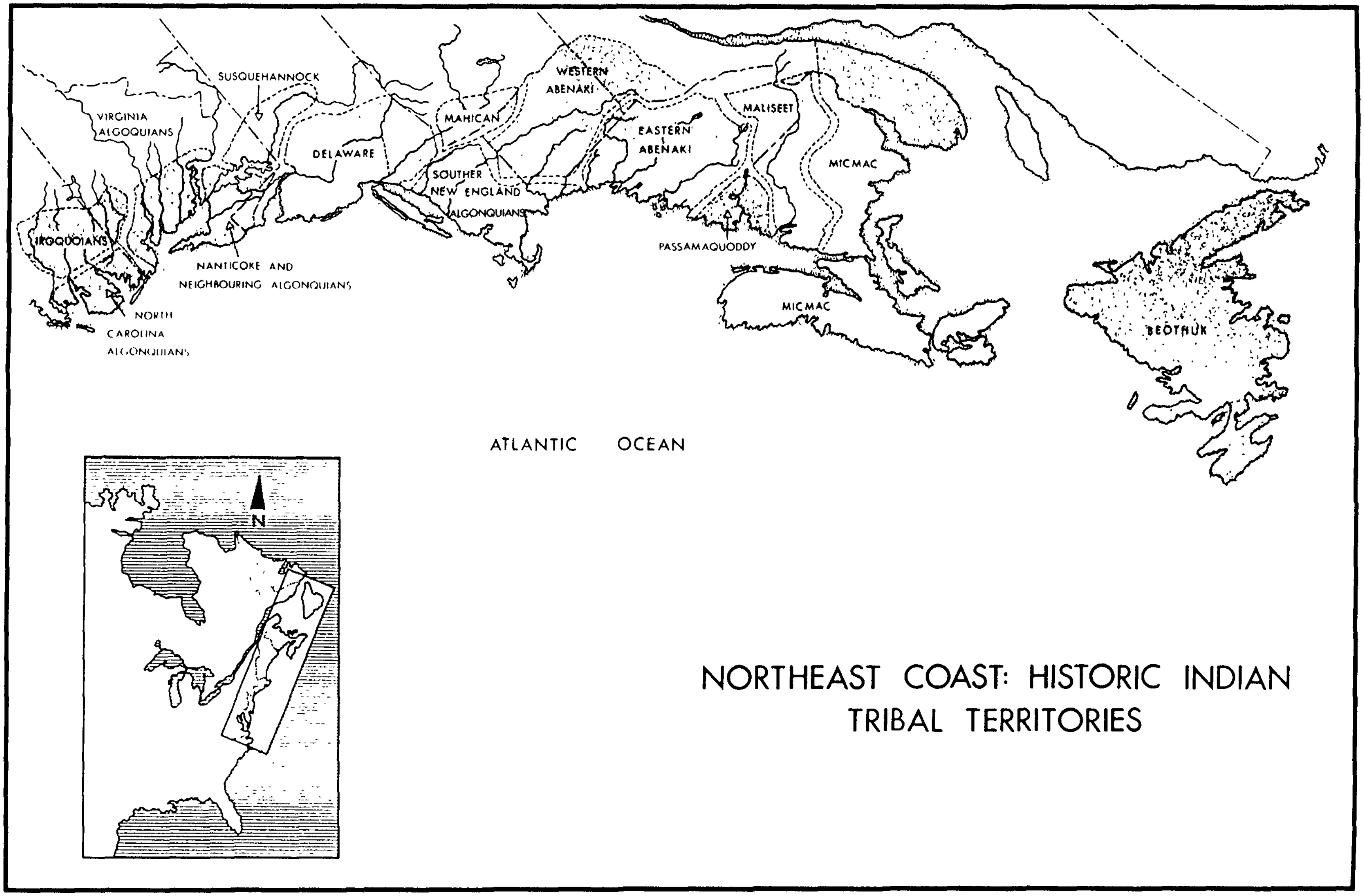
The region experiences marked seasonal fluctuations in productivity. In terms of human exploitation, late summer and autumn are the most productive seasons; this is the time of maximum marine and terrestrial plant productivity, the period when marine fish and mammals are inshore in their largest numbers, and when terrestrial animals are fattening for the cold seasons. Autumn is also the season in which clear and settled weather is most common, and consequently access to marine and insular resources is easiest and safest.

European contact and ethnohistory:

The native people who lived in the Quoddy region during the protohistoric period spoke a language belonging to the Eastern Algonkian language family. Figure 1-3 shows the distribution of native tribes on the Northeast coast during the early historic period. Except for a few Iroquoian speaking groups in the extreme south of New England, all of the tribes living in the coastal drainages of New England and the Maritime Provinces were Algonkian speakers (Snow 1980:26).

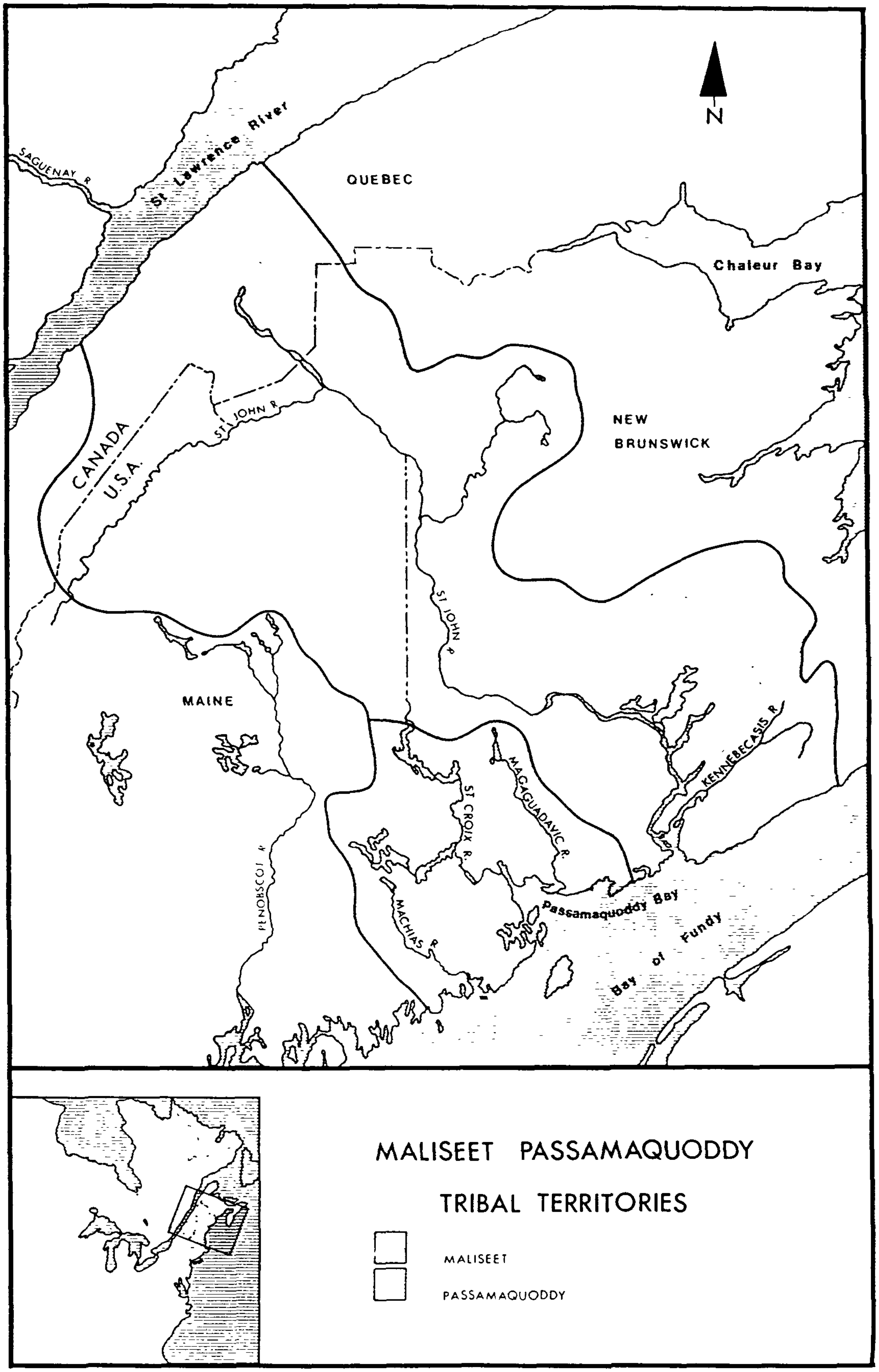
Figure 1-4 shows the historic tribal territories immediately adjacent to the Quoddy region. The group which inhabited the Quoddy region is called the Passamaquoddy; a closely related group, the Maliseet, lived in the adjacent St. John drainage

FIGURE 1-3: Historic native tribal territories on the Northeast coast.



NORTHEAST COAST: HISTORIC INDIAN TRIBAL TERRITORIES

FIGURE 1-4: Historic Maliseet/Passamaquoddy tribal territories.


N
St. Lawrence River
SAGUENAY R
QUEBEC
Chaleur Bay
NEW
BRUNSWICK
CANADA
U.S.A.
ST. JOHN R
ST JOHN R
MAINE
ST CROIX R.
MAGAGUADAVIC R.
KENNEBECASIS R.
PENOBSCOT R
MACHIAS R
Passamaquoddy Bay
Bay of Fundy
MALISEET PASSAMAQUODDY
TRIBAL TERRITORIES
MALISEET
PASSAMAQUODDY

(Erickson 1978). The Micmac (Bock 1978) lived to the north and east of these groups, while the Eastern Abenaki (Snow 1978) lived to the south and west.

Although the Quoddy region was the scene of relatively early European activity (De Monts and Champlain wintered in the St. Croix estuary in 1604), accounts of early historic native culture, which definitely refer to the Quoddy region, are lacking. Lescarbot's (1928) accounts may partially refer to the region, but he spent much more time among the Micmac at Port Royal, Nova Scotia, than among the inhabitants of the Quoddy region, and his accounts are most applicable to the Micmac. Champlain's (Quinn 1983:53-54) and Biard's (1959) accounts also probably refer mainly to Micmac and Abenaki.

Hoffman (1955) has postulated a series of population movements in the Maine/Maritimes area following the observations of these early European explorers, including the extinction of the population in the St. Croix/Passamaquoddy area, and their replacement by Eastern Abenaki from the Penobscot drainage. His interpretation is based on ten native words recorded by Lescarbot which do not appear to belong to any of the known native languages in the area. Snow (1976) considers the evidence for this scenario to be trivial, and concludes that the native people who were observed on Passamaquoddy Bay and on the lower St. John, from

AD1600-1620, were the ancestors of the historic Maliseet/ Passamaquoddy.

Maliseet and Passamaquoddy are mutually intelligible dialects of the same language (Erickson 1978; Goddard 1978). The two tribes differed in economic orientation, the Maliseet being inland hunters living on the St. John, and the Passamaquoddy being sea mammal hunters living on the shores of the Quoddy region (Erickson 1978; Wallis and Wallis 1957). A commonly cited economic pursuit for the historic Passamaquoddy is the hunting of marine mammals, especially porpoise (Ganong 1899:12, 1930:123, 1983:12; Sanger 1987:63; Wherry 1981:15).

It is not known how long the Passamaquoddy have been a separate identifiable group (Herisson 1974); the Penobscot (Abenaki) regarded the Passamaquoddy as a recent offshoot of the Maliseet, dating back only a few hundred years from the present (Speck 1940). Culturally and linguistically, the Maliseet/ Passamaquoddy appear to have been more similar to the Eastern Abenaki than to the Micmac (Snow 1980; Wallis and Wallis 1957), and there was a tradition of animosity between the Maliseet and the Micmac. By the late 19th century, the Passamaquoddy, Maliseet and Penobscot (Abenaki) dialects had become almost indistinguishable (Herisson 1974).

The points I wish to make in summing up this section are threefold. First, there is no ethnohistoric baseline for the Quoddy region <u>per se</u>; most of the ethnographic information available for the Maine/Maritimes area refers to native people whose culture had been radically altered by European contact, depopulation and the adoption of the fur trade (cf. Turnbull and Allen 1988:255). Second, it is, consequently, not surprising that archaeologists have met with little success in applying subsistence and settlement models drawn from the ethnographies of the historic Passamaquoddy and adjacent groups to archaeological data from the region (e.g. Davis 1978; Sanger 1986, 1988; Stewart 1982; Wherry 1981:3). Third, the prehistoric-protohistoric-historic interface is poorly understood in the Quoddy region (Black 1988a:173; Sanger 1987:13-14), and presents a major interpretive challenge that must now be addressed mainly though archaeological research (cf. Sanger 1987:14).

Culture history terminology:

In 1973, a number of archaeologists working in the Maine/Maritimes area met to discuss issues of cultural taxonomy. In Sanger's (1974:129) words:

> "The classical Archaic-Woodland stage concept was reviewed and it was agreed that in this area the distinction is essentially meaningless. It was decided, therefore, to abandon these terms, although it was suggested that the presence or absence of ceramics could be a useful referent. Accordingly, it was decided to refer to sites as 'aceramic' or 'ceramic', using lower cases to avoid any stage connotations.'

This terminology was intended to carry neither temporal nor formal connotations beyond the mere presence/absence of ceramics.

It is not clear exactly what this terminology was intended to signify or measure. It clarifies nothing on a temporal scale, unless the presence of ceramics is considered to be of considerable and consistent temporal significance. Aceramic does not distinguish between preceramic (Paleoindian, Archaic) assemblages, post-ceramic (e.g. Foulkes 1981) assemblages, or 'Ceramic' period assemblages not containing ceramics.

After 1973 the dramatic increase in archaeological research in the coastal Northeast complicated the taxonomic issue. Earlier researchers avoided the issue by using neutral terms such as 'later settlements' (e.g. Pearson 1970); such terms continue to be used occasionally (e.g. Davis 1978; Tuck 1982). Researchers in areas adjacent to the Maine/Maritimes continue to use Woodland terminology (e.g. Mason 1981; McManamon 1984; Ritchie 1969; Wright 1979).

Archaeologists in the Maine/Maritimes area have become divided into two groups: (i) those who use Ceramic terminology (e.g. Deal 1985; Kopec 1985; Sanger 1979a; Spiess et al. 1983; Tuck 1984); and (ii) those who use Woodland terminology (Allen 1980; Foulkes 1981; Keenlyside 1980; Nash 1980; Stewart 1980; Turnbull 1976; Yesner 1983). Ceramic terminology has received no attention in macro-regional discussions of Eastern North American cultural taxonomies (e.g. Snow 1980; Stoltman 1978; Taylor and Meighan 1978).

Some archaeologists in the Maine/Maritimes have abused the 'period' concept by implicitly treating the Ceramic period as a stage. Davis, for example, in his survey reports on southern New Brunswick, goes so far as to treat shell middens as diagnostic features of the 'Ceramic period', assigning them to it in the absence of any other temporal or formal information. More commonly, following a practice apparently initiated by Bourque (1971), a number of archaeologists have explicitly treated the Ceramic period as a temporal unit designating the period from ca. 2000bp to historic contact (e.g. Sanger 1979a; Tuck 1982, 1984).[2] Spiess et al. (1983) and Deal (1985) distinguish Early, Middle, and Late Ceramic period units, which are rough equivalents of the Early, Middle and Late Woodland units used elsewhere in the Northeast.

Ceramic period terminology appears to be completely redundant temporally and formally with Woodland terminology. The latter terminology is just as applicable in the Maine/Maritimes area as it is in other areas of the peripheral Northeast, where it has been used with reference to post-Archaic, ceramic-using cultures with essentially Archaic economies (e.g. Ford 1974; Willey 1966; Willey and Phillips 1958; Wright 1979). In contrast to Woodland, Archaic has been retained as a formal and temporal taxonomic unit in the Maine/Maritimes area (e.g. Deal 1985; Sanger 1979a, 1988; Spiess et al. 1983; Turnbull and Allen 1988:251).

The obvious course of action is to simplify Maine/Maritimes cultural taxonomy by discarding Ceramic period terminology and applying Woodland or 'qualified' Woodland taxonomic terms. I have done so in my previous publications on Quoddy region prehistory (Bishop and Black 1988; Black 1983, 1985a, 1988a), and, in this study, I continue to use the Maritime Woodland terminology suggested by Keenlyside (1983; see also Turnbull and Allen 1988:251). My rationale for using this terminology is that it refers, on one hand (Woodland), to the cultural relationships between the Quoddy region and other parts of the Northeast during prehistory, and, on the other hand (Maritime), to the marine and littoral foraging adaptations adopted by many prehistoric people along the coast of the 'Far Northeast'.

The Quoddy region archaeological site inventory:

Archaeological surveys in the Canadian Quoddy region (e.g. Black 1984a; Davis 1982b, 1983; Davis and Christianson 1981; Davis and Ferguson 1980, 1981; Davis and Powell 1983; Hale 1985; Sanger 1971; Stoddard et al. 1952) have been restricted mainly to marine shorelines; to date virtually all of the shorelines in the region, except for the Wolves, have been surveyed. One hundred and fifty-six archaeological sites have been designated; there is no definite locational information for 14 of these sites, and these may be redundant with sites designated by other Borden numbers. Thus, the number of analyzable sites in the region is 142.

Fifty-seven (40%) of the sites are located in the mainland portions of the region; the remaining 85 sites (60%) are located on islands. Of the analyzable sites, 30% are prehistoric, 23% are historic, and 47% are of uncertain dating and cultural affiliation. Shell midden sites are very common (51% of the site inventory), and at least 35 shell middens definitely contain prehistoric cultural components. Many of the smaller shell middens are of unknown cultural affiliation, and some of these may represent historic baiter's mounds. Non-shell midden prehistoric sites occur much less frequently than shell middens, accounting for only 5% of the site inventory, but this may reflect their smaller size and lower archaeological visibility.3

Regional analyses of this large and complex site inventory have begun only recently (e.g. Black 1984d; Sanger 1987). Such attempts have been hampered by non-comparability of available data.

Archaeological sites, especially prehistoric shell middens, are clustered in particular parts of the region, for example, on the northern shore of Passamaquoddy Bay, and on the northern West Isles (Table 1-1). These two regions have received the bulk of archaeological attention, and much of the interpretation in this study is framed as a relatively simplistic comparison between

TABLE 1-1: Distribution of designated archaeological sites in the Quoddy region.

Subregion:	size (km):	# sites:	% inventory:	# per km:
Passamaquoddy Bay Mainland:	167.5	46.0	32.3	0.27
Bay of Fundy Mainland:	201.0	11.0	7.7	0.05
Passamaquoddy Bay Islands:	26.5	17.0	12.0	0.64
Bay of Fundy Islands:	4.5	0.0	0.0	0.00
Northern West Isles:	114.0	26.0	18.3	0.22
Southern West Isles:	114.5	9.0	6.3	0.07
Back Bay Shelf:	48.5	22.0	15.5	0.45
Grand Manan and the Wolves:	145.0	11.0	7.8	0.07
Totals:	821.5	142.0	99.9	
Average number of sites per km:				0.17

FIGURE 1-5: Suggested subregions for intra-regional analyses of Canadian Quoddy region archaeology.

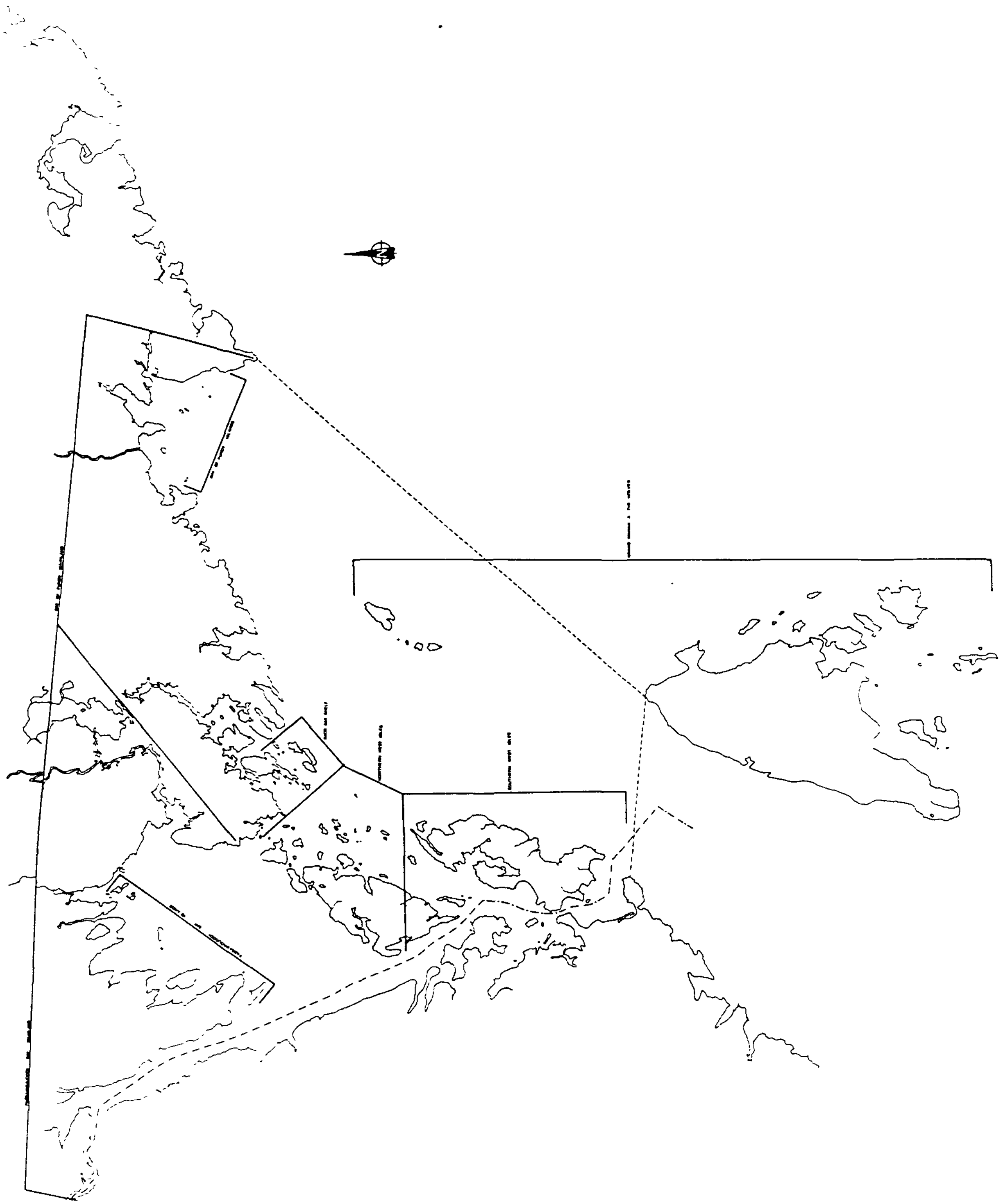
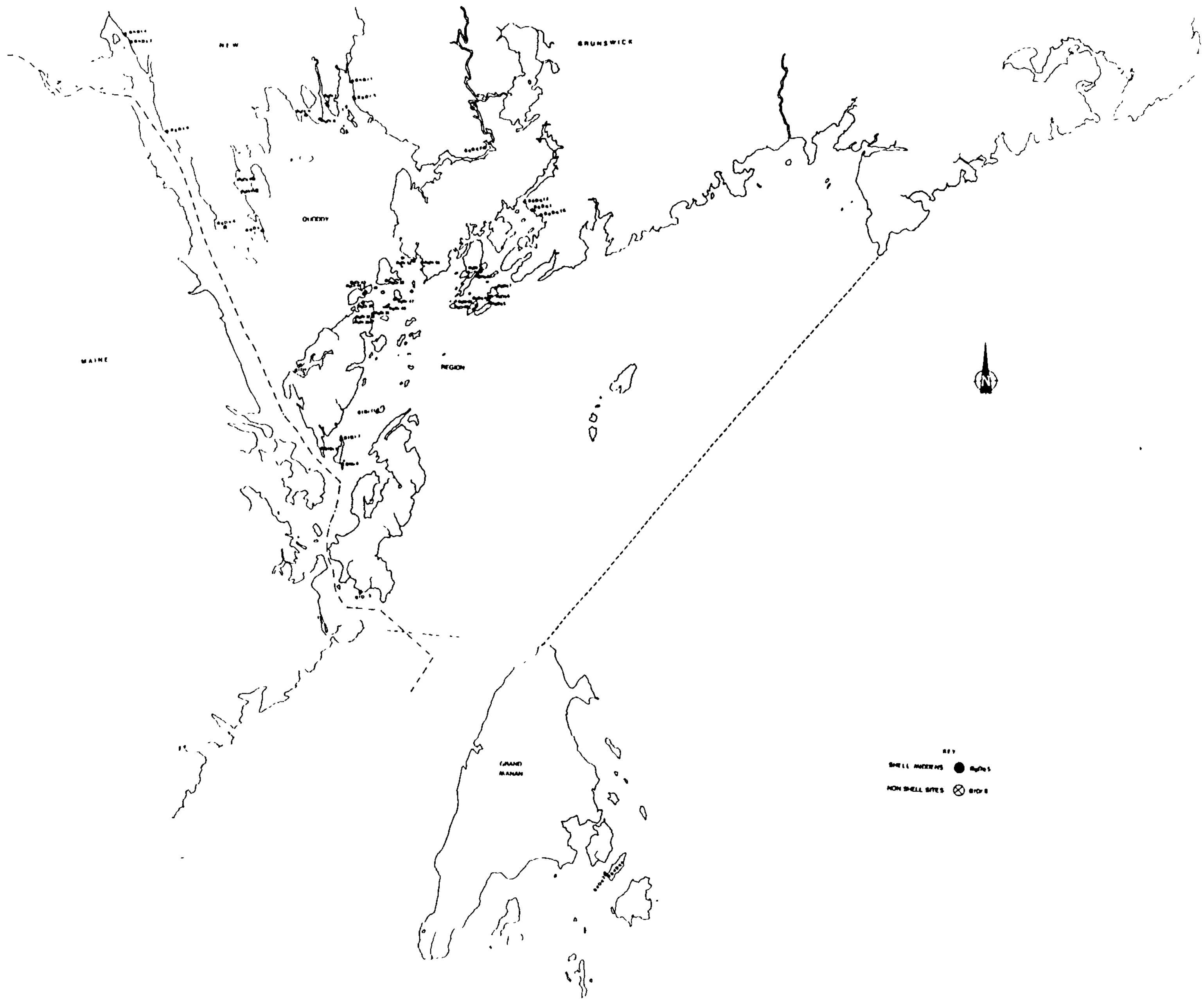


FIGURE 1-6: Locations of 42 prehistoric sites in the Quoddy region. Solid points are shell middens; crossed points are non-shell sites.


NEW
BRUNSWICK
QUODDY
REGION
MAINE
GRAND
MANAN
KEY
SHELL MIDDENS
NON SHELL SITES

mainland and insular sites. For finer grained intra-regional comparisons, I suggest that the subregions shown on Figure 1-5, and in Table 1-1, be used as analytical units. Figure 1-6 shows the locations of 42 prehistoric sites referred to in this study; 15 of these are located on the mainland and 27 on the islands.

Previous archaeological research:

Previous archaeological research in the Quoddy region has been reviewed and summarized in several places (e.g. Bishop 1983a; Black 1983; Connolly 1977; Joudry 1955; McCormick 1980; Sanger 1971, 1986). Only research conducted or reported since 1983 will be reviewed here. This summary is presented in four parts: overviews, insular research, mainland research, and other relevant research.

Overviews:

Overviews of the prehistory and archaeology of the Maritime Provinces are rare. Tuck has recently published a paper (1982) summarizing the prehistory of the Atlantic coast of Canada and a book (1984) on Maritimes prehistory. Both accounts refer relatively cursorily to archaeology in the Quoddy region and summarize only the mainland research conducted by Sanger and Davis to about 1975.

Tuck's (1984) book has been thoroughly critiqued by Turnbull and Allen, who contend (1988:260) that while the book may be 'acceptable as reflective of thinking in 1976... it is a disservice [on the part of the Canadian Museum of Civilization] to everyone, especially Tuck, to publish it in 1984.' Turnbull and Allen's review is also the most recent available overview of Maritimes prehistory. All of the major sites are mentioned, and both published and unpublished research are addressed; unfortunately sources are not cited.

The following brief overview of current thinking on Maritimes prehistory is largely drawn from Turnbull and Allen's review. My purpose in presenting this summary is to provide a long range temporal perspective on the maritime adaptations which are the subject of this dissertation.

There is increasing evidence for Paleoindian occupations in the Maritimes, although much of it consists of surface finds of diagnostic projectile points. Paleoindian socio-economics are enigmatic due to lack of evidence. MacDonald (1969) suggested caribou hunting in a tundra environment. Tuck speculates there may have been a maritime focus to Paleoindian subsistence, although the geological evidence indicates lower marine productivity prior to 5000bp (Sanger 1988).

Tuck characterizes the Early and Middle Archaic periods (10,000bp-5000bp) as a 'great hiatus' in Maritimes culture history. Turnbull and Allen agree with this description, but, given the recent evidence for Early and Middle Archaic assemblages in Maine, they suggest that the 'hiatus' may be a result of low archaeological visibility rather than lack of cultural activity during this long time period. Archaic subsistence patterns are also enigmatic, although there is increasing evidence in Maine for anadromous fish exploitation throughout the Archaic. In the Late Archaic a definite maritime adaptation becomes evident as well.

The Late Archaic period has received considerable attention, but cultural interpretations of Late Archaic assemblages remain controversial. At present, assemblages identified as Laurentian Archaic are restricted mainly to the interior of southwestern New Brunswick, suggesting a terrestrial adaptation. Maritime Archaic sites are most commonly found in estuarine and insular locations, suggesting a maritime orientation. Assemblages previously identified as Shield Archaic by Sanger are now interpreted as late 'Pre-ceramic' variants of Maritime Archaic by Tuck, and as possible late variants of the Susquehanna tradition by Turnbull and Allen. Allen has excavated a similar lithic assemblage at the Oxbow site in association with ceramics.

Recent research has increased the range of Susquehanna-like assemblages known from the Maritimes, although most have been found in southwestern New Brunswick. Turnbull and Allen interpret Susquehanna as representing a movement of people to the Maritimes from the mid-Atlantic coast, and suggest there may be a continuity of people and culture from Susquehanna through to the historic period. After the Susquehanna incursion, Turnbull and Allen see a de-emphasis of contacts between the Maritimes and other parts of the Atlantic coast, and increasing evidence for contacts up the St. Lawrence river.

Tuck designates the period from 5000bp to 2500bp as Late Archaic. Turnbull and Allen contend that the period from 3000bp to 2500bp should be included in the Ceramic (Woodland) period, because of the recent evidence for Meadowood tradition occupations followed by intensive Adena contacts in New Brunswick and Nova Scotia. They consider Meadowood to be the culture that introduced ceramics to the Maritimes. There have been only two finds of Vinette I ceramics; however, some 'Middle Woodland' ceramic motifs may be Meadowood-related, and date to the Early Woodland period in the Maritimes.

Turnbull and Allen (1988:256) contend that a 'chronological approach to the culture history of the Ceramic period is needed' because researchers tend to treat it as a single temporal unit, and to rely on ethnohistoric information and ethnographic analogies to interpret it. The ground work has been laid for this sort of approach with the recovery of stratified sequences of lithic and ceramic assemblages spanning the entire Woodland period from sites such as Oxbow (Allen 1981) and Fulton Island (Foulkes 1981). Both Oxbow and Fulton Island are riverine sites stratified by natural alluvial processes.

Turnbull and Allen emphasize evidence for areal variability and regional specificity of subsistence practices during the Woodland period. However, all parts of the Maritimes are close to the sea, and maritime subsistence practices may have been undertaken by most prehistoric populations. In this respect, the Maritimes are different from New England, where coastal/interior differences in subsistence and ethnicity may have been more pronounced (cf. Sanger 1988; Snow 1980).

Sanger (1988) presents an overview and analysis of research into prehistoric maritime adaptations in the Gulf of Maine. While concluding that there is now evidence for cultures with significant maritime adaptations as early as 5000bp, Sanger emphasizes the spatial and temporal variability in the committment to maritime exploitation in the Gulf. In particular, he notes that the Quoddy region is different from the other parts of the Gulf of Maine in terms of fisheries biology (ie. winter outmigrations of many fish species).

Nash (1983) has edited a volume comparing the Northeast and Northwest coasts archaeologically. None of the papers in his volume address the Quoddy region specifically, but several (e.g. Fladmark 1983; Spiess et al. 1983; Yesner 1983) provide background and comparative material relevant to the present study.

Turnbull and Davis (1986) have compiled an exhaustive bibliography of archaeological research and related topics in the

Maritimes to 1984. Deal (in prep.) is compiling an edited volume addressing many aspects of both prehistoric and historic archaeology in the Maritimes.

<u>Insular research</u>:

In addition to the coastal surveys referred to above, five testing and excavation projects have been conducted at prehistoric sites in the insular Quoddy region. Davis and Ferguson (1980) discovered 5 ground stone axe/adzes eroding into the intertidal zone at the Rouen Islet site (BfDr8), offshore from the south end of Indian Island. Davis (1982a) interprets these artifacts as representing a cache or a burial dating to the period between 3500bp and 2500bp on typological grounds; the site has not been radiocarbon dated.

The Rouen Islet site was tested briefly in 1983 but no additional cultural materials were recovered. This site was probably not coastal in the strict sense of the term, and only the fortunate juxtaposition of site, high water line and archaeological surveyors led to its discovery.

The Partridge Island site (BgDr48), located northeast of Deer Island in the northern West Isles, was excavated by Jennifer Bishop and I in 1981 (Bishop 1983a, in press; Bishop and Black 1988; Black 1983, in press a, in press b). Partridge Island was occupied between ca. 2400bp and ca. 1500bp. It contains two stratigraphically superimposed cultural components, an Early

Maritime Woodland component characterized by a contracting stemmed projectile point, a bone awl and a sherd of linear trailed decorated ceramic, and a series of Middle Maritime Woodland occupations characterized by corner notched bifaces, dentate stamped ceramics, and a variety of bone artifacts.

In the Early Maritime Woodland component fishing for large cod fish is the most strongly represented subsistence activity, although there is some evidence for shellfish gathering as well. A summer/autumn seasonality is postulated for this occupation. In the Middle Maritime Woodland occupations a series of faunal assemblages indicates a variety of subsistence activities: shellfishing, fishing for codfish and herring, sealing, the hunting and trapping of deer, moose, beaver and marten, and the capturing of migratory birds. Both warm and cold season Middle Woodland occupations are inferred.

Turnbull (1981; see also Black and Johnston 1986; Rojo 1987) tested the Gooseberry Point site (BfDr3) located at the south end of Campobello Island. This severely eroded shell midden contained large amounts of lithic artifacts and debitage, and bone tools, and small amounts of highly fragmented ceramics. It has been dated to ca. 650bp.

In 1983 I briefly tested the Pendleton Passage site (BgDr38), located at the north end of Deer Island (Black 1984b). This site consists of a shallow shell midden deposit, located adjacent to an historic site, some 50m from the modern high water line. The prehistoric component contains dentate stamped ceramics, and has been dated to ca. 1600bp.

The Bliss Islands Archaeology Project, which I have been directing since 1983, is the largest research project undertaken in the insular Quoddy region to date. The results of this project are presented in the balance of this dissertation.

Mainland research:

Hammon-Demma (1984) completed a thesis on the Holt's Point site (BgDr9), based mainly on the collections excavated from the site during the 1950's. However, her research did include some testing and column sampling. Hammon-Demma's thesis purports to be a study of cultural adaptation, although it is, in fact, a traditional artifact-oriented site report with a poorly thought out review of ecological anthropology tacked onto it. This thesis includes some unfortunate misinformation. For example, Hammon-Demma reports (1984:107) that Pat Allen has identified Vinette I ceramics in the Minister's Island site; Allen (1985:p.c.) states that this is not the case.

Sanger and his students and colleagues have continued to report the results of Sanger's excavations in the Quoddy region during the 1960's and 1970's. Linda Jefferson (Memorial University) is preparing a thesis on the Minister's Island site (BgDs10), which has been tested and excavated on at least four separate occasions. Crotts (1984) has analyzed lithic material types and distributions from several of the sites excavated by Sanger.

Sanger (1986) presents an overview of his research on the Passamaquoddy Bay sites incorporating the most recent information. His culture history model for the area spans the time range from deglaciation to the historic period, although he acknowledges that there is no Paleoindian, no Early and Middle Archaic, and little Late Archaic material from the Quoddy region proper. Sanger identifies only one Late Archaic culture, Susquehanna, although he infers the presence of others. He equates the Ceramic Period to the Quoddy Tradition, which he sees as a relatively generalized and stable adaptation to the Quoddy region environment over a period of 1500 years. He emphasizes the increasing evidence for year-round occupation of the coast, and suggests there may be some evidence for interior/coastal population dichotomies in the Maine/Maritimes area during the Ceramic period.

I see a number of problems with Sanger's (1986) summary. It exemplifies the ahistorical approaches to the Ceramic period which Turnbull and Allen (1988:256) have criticized. Sanger subdivides the period into Early and Middle (2500-1000bp) and Late (1000-350bp); however, it is not clear whether his Quoddy Tradition model applies to both of these subperiods or only to the earlier 1500 years.

Sanger makes no attempt to seriate ceramics from the Passamaquoddy Bay sites, although he reports the occurrence of a sherd of Vinette I-like ceramic from the Minister's Island site. He suggests that a burial from beneath the Minister's Island midden is Adena-related and associated with Pearson's 2370+/-80bp radiocarbon date. This interpretation now seems unlikely, since Jefferson (1988:p.c.) has dated the burial at 1930+/-110bp.

Sanger (1986:143, 146) does present a chronological interpretation of Archaic and Ceramic period projectile points. However, since all of the illustrated points come from the interior of the St. Croix drainage (ie. the Edward Brown collection, see Kopec 1985), it is difficult to accept their applicability to Passamaquoddy Bay prehistory at face value, especially if, as Sanger (1986:154) states, 'the St. Croix River may have been more of a barrier than a highway, and served to separate coastal from interior bands.'

Sanger (1986:146) illustrates 'Late Ceramic Period' projectile points, one of which is a triangular Levanna-like specimen. Sanger (1979a:113-114; see also Loring 1988:48; Snow 1980:141) has previously contended that during the late prehistoric period there is a contrast between the use of triangular points in central and western Maine and narrow corner and side notched points in eastern Maine and the Maritimes. These point types are not discussed in the 1986 paper, and again, the relevance of the illustrated points to Passamaquoddy Bay culture history is unclear.

Sanger (1987) reports on the Carson site (BgDr5) excavated in 1969. This site averages about 40cm depth and has been disturbed by post-depositional processes; no stratigraphy was recognised. Three occupations are represented: the earliest is interpreted as Late Archaic and consists of expanding stemmed projectile points in association with the subsoil; the second and main occupation dates to the Late Ceramic period, while the third is an historic occupation consisting of a few metal objects and beads. The Late Ceramic occupation is characterized by large numbers of bifaces, corner and side notched projectile points, thumbnail scrapers, grit and shell tempered, cord wrapped stick impressed ceramics, modified beaver incisors, and a diverse faunal assemblage. Sanger interprets this assemblage as resulting from habitation of the site for one or a few winters by a small number of people about 1000 years ago. As regards subsistence patterns, 'despite the littoral setting, the impression is one of terrestrial hunter-gatherers utilizing relatively few marine resources' (Sanger 1987:84).

The report includes a comparison of the Carson site to a number of sites in Passamaquoddy Bay and northern Maine with components dating to the late prehistoric period. Sanger develops a model of the Quoddy Tradition adaptation similar to that put forth in Sanger (1986). However, here it is clear that the model is intended to apply to the entire Ceramic period:

> "With the onset of clam and mussel shell middens there began a way of life closely tied to the resources, both terrestrial and marine, of the Quoddy Region. Starting around 2200 B.P., this lifestyle is called the Quoddy Tradition (Sanger 1986, In Prep.). Throughout the nearly 2,000 years of the Quoddy Tradition there are changes in artifact styles, seen mainly in projectile points [stemmed to notched forms] and ceramics [dentate stamps to cord wrapped stick impressions]. However, the settlement and subsistence systems both indicate a great deal of stability, as evidenced by the continuity of species selection and the number of multi-component sites. The larger sites, those located around the north shore of Passamaquoddy Bay, indicate cold weather, fall through spring occupation. Research into offshore island sites has just begun; it may demonstrate a different seasonal residence pattern (Black 1983). Site locational analysis indicates the placement of sites to maximise shelter from north and northwest winds, exposure to the sun, access to varied exploitation zones, and concern for beaching and launching canoes. In conclusion, the Quoddy Tradition represents nearly 2,000 years of cultural stability and continuity that existed without interruption until the coming of Europeans about A.D. 1600. The many sites in the Quoddy Region reflect a population moving around the region in response to resource availability" (Sanger 1987:136).

In a review of Sanger (1987), Loring (1988) points out the similarities between late prehistoric corner and side notched projectile points from northern Maine, the Quoddy region, Newfoundland and Labrador. He postulates the existence of an exchange network on the north Atlantic coast in the late prehistoric period. This hypothesis receives some confirmation through the presence of Ramah chert from Labrador in some northern Maine sites (Loring 1988:53), and in sites on the outer coast of

Nova Scotia (Sheldon 1988). However, as Loring notes, no Ramah chert has been identified from Quoddy region sites.

Recent field work has been undertaken by Archaeological Services of New Brunswick on the mainland shores of the Quoddy region. Surveys of the Canadian portions of the St. Croix river system have included re-survey of the St. Croix estuary (Hale 1985:11-22). As a result, recent information and dating are available for major shell midden sites such as the Simpson's Farm site (BhDt4) excavated by Baird (1881), and the Sandy Point site (BgDs6) excavated by Sanger (Lavoie 1971). These sites and several others on Passamaquoddy Bay were test excavated and column sampled in 1986. Analyses of these mainland column samples are underway, but the results are not yet available.[4] This research has the potential to enhance our understanding of the similarities and differences between mainland and insular sites in the Quoddy region.

Archaeological Services of New Brunswick has also sponsored analytical work involving Quoddy region sites. For example, Wilson (1983) completed a thesis comparing lithic utilization at the Holt's Point and Partridge Island sites with that of several interior sites in New Brunswick. Bishop (1983b) has published a site report based on part of Matthew's (1884) material from the Phil's Beach site.

****

LIVING CLOSE TO THE LEDGE

Other relevant research:

As a result of the St. Croix surveys several sites in the interior parts of that drainage have been excavated (Allen 1983; Deal 1984). Deal (1985, 1986) reports a cultural sequence spanning the past 6000 years, including Middle Archaic, Susquehanna, Meadowood and Ceramic (Woodland) occupations at the Mud Lake Stream site (BkDw5). Subsistence and seasonality evidence from Mud Lake Stream includes calcined faunal remains and carbonized macrobotanics, indicating fall to spring seasonality for the Woodland occupations.

Deal's research provides important evidence about the interior counterparts of the prehistoric coastal occupations in the Quoddy region. The Mud Lake Stream evidence substantiates the interpretation that the Quoddy region was occupied from at least Middle Archaic times.

Kopec (1985) and Sanger (1986) report interior research conducted on the American side of the St. Croix drainage. Armstrong (1982) presents an analysis of surface collected artifacts from the Canadian side of the St. Croix.

A number of theses by Sanger's students relating to his research in Maine are also closely related to research in the Quoddy region. For example, Skinas (1987) has completed a case study of shell midden formation processes at the Todd site, and Carlson (1986) has developed a socio-ecological model of maritime fishing strategies for the Booth Bay region.

One of the problems in interpreting Maritimes provinces prehistory has been the lack of recent prehistoric research in Nova Scotia. However, Sheldon (1988) presents a useful interpretation of Late Woodland occupations in Nova Scotia based on the material from the Brown site, and Davis (1988) is conducting research on an Early Woodland mound site near Halifax.

General aims of the Bliss Islands research:

I have planned my research in the Quoddy region with the intention of addressing three distinct focuses of archaeological and anthropological endeavour: (i) the prehistory of the Quoddy region and the Maine/Maritimes area; (ii) the human ecology of maritime adapted hunter/gatherers; and (iii) the analysis of coastal shell midden sites. I have discussed the literature pertaining to regional prehistory in the sections above; the other two focuses are briefly introduced in this section.

I have chosen human ecology as the central concern of this research for both theoretical and practical reasons. Recently, Butzer (1982) has described archaeology as essentially a study of human ecology, a point-of-view with which I largely agree. The ecological paradigm remains one of the dominant interpretive paradigms in archaeology.

Nowhere is this more apparent than in the burgeoning literature concerning maritime adaptations (e.g. Aikens, Ames and

Sanger 1986; Anderson 1981; Bailey 1975; Custer 1988; D. Davis 1988; Fitzhugh 1975; Fladmark 1975; Lavin 1988; McManamon 1984; Meehan 1977, 1982; Nash 1983; Osborn 1977a, 1977b; Perlman 1980; Reitz 1988; Russo 1988; Sanger 1985a, 1988; Schalk 1977; Sutton 1982; Yesner 1980). This theoretical interest is closely tied to attempts to develop predictive/explanatory models of paleotechnic hunter-gatherer adaptations in general (e.g. Bettinger 1980; Earle and Christenson 1980; Jochim 1976, 1981; Perlman 1974; Reidhead 1979; Winterhalder and Smith 1981).

One of the problems with these approaches in many interior areas is that they must remain largely theoretical due to the absence of direct archaeological evidence of prehistoric subsistence and diet (e.g. Keene 1981). Indeed, one could argue that the emphasis on theory and prediction is a response to the lack of hard data. In coastal environments, direct evidence about paleoecology and prehistoric subsistence patterns is preserved in much greater quantity and quality than in most other types of environments. The ability to acquire this type of hard data presents a practical reason for adopting an ecological perspective.

The body of archaeological literature concerning the excavation, analysis and interpretation of coastal shell middens has a considerable time depth and is rapidly growing (for summaries of this literature, see Ambrose 1967; Shenkel 1971; Waselkov 1982, 1987; Yesner 1977). Ambrose (1967:178) has characterized analyses of shell midden sites as belonging to several different orientations. One of these, the 'ecological view', addresses the shell midden as 'in essence a stratigraphic and zoological problem'. During the 1970's and 1980's zoological, stratigraphic, subsistence and taphonomic studies of shell middens have undergone a resurgence (e.g. Claassen 1982; Ham 1983; May 1982; Muckle 1982, 1985; Stein 1980; Stucki 1981; Wessen 1982). My approaches to Quoddy region shell middens fall clearly within this 'ecological view' (Black in press b).

Specific aims of this dissertation:

The purpose of the present study is to develop models of the prehistoric cultural history and the prehistoric human ecology of the insular Quoddy region through a detailed analysis of the prehistoric site inventory of the Bliss Islands. To accomplish these ends, I treat the Bliss Islands prehistoric site inventory as a microcosm of the insular Quoddy region prehistoric site inventory.

This research design entails the following four steps. In chapters 2 and 3, I summarize the archaeological research conducted on the Bliss Islands, describe the prehistoric site inventory of the islands, and define units of analysis in this inventory. In Chapter 4, I present evidence indicating that the Bliss Islands prehistoric site inventory is representative of the entire Quoddy region site inventory. I use the artifactual assemblages from the units of analysis defined in Chapter 3 to construct a cultural history model for the islands in Chapter 5. I analyze the faunal assemblages from the units of analysis defined in Chapter 3 to construct models of prehistoric subsistence (in Chapter 6) and models of prehistoric seasonality/settlement patterns (in Chapter 7). Throughout chapters 4, 5, 6, and 7, I compare and contrast my interpretations with previous interpretations of Quoddy region cultural history and human ecology based on the mainland site inventory.

From methodological and theoretical perspectives, I address two issues which are currently controversial in the archaeology of the Northeast coast. First, relating to the construction of culture history and temporal change models based on coastal archaeological sites, I address the controversy concerning the interpretation of stratification in shell middens (Barber 1982:11-12; Black 1983:41-63, 165-66, 1988a:45, 85, in press b; Brennan 1977; Sanger 1981, 1985b; Spiess 1988; Spiess and Hedden 1983). Second, relating to human ecology on the Northeast coast, I address the question of interpreting functional specialization in Northeastern shell middens (Barber 1982; Black 1988a; Black and Whitehead 1988; Sanger 1985b).

To make my own predispositions clear from the outset, I approached this research with the expectation of detecting stratigraphic integrity in the shell middens, and of finding functionally specialized prehistoric sites and components in the Quoddy region. These predispositions stemmed initially from my experiences with shell midden archaeology on the Northwest coast of North America.

Notes:

1. I use the abbreviation 'bp' to designate dates in radiocarbon years prior to 1950, and 'BP' to designate calendar years before present, in accordance with a convention adopted by radiocarbon specialists (e.g. Burleigh 1974). Historic dates are reported as 'BC' or 'AD'.

2. It is now generally recognised that ceramic technology was adopted in some parts of the Maine/Maritimes area by ca. 3000bp (Turnbull and Allen 1988:256).

3. The differences between the statistics presented here and those presented in Black and Turnbull (1986) reflect information gathered during field work conducted from 1985-1988.

4. The column samples from the Minister's Island site are being analyzed by Linda Jefferson (Memorial University) as part of an M.A. thesis on that site. Louise Hale (Archaeological Services of New Brunswick) is preparing a report on the column samples from several mainland sites. Hammon-Demma's (1984) thesis includes analyses of column samples from the Holt's Point site.

PART II (the happening world)

Blank page inserted to maintain continuity.

CHAPTER 2:

THE BLISS ISLANDS ARCHAEOLOGY PROJECT, PHASE I.

"Boys, they must have eaten some clams in those days."
(Murchie Mitchell, Aug. 8, 1983, at the Weir site)

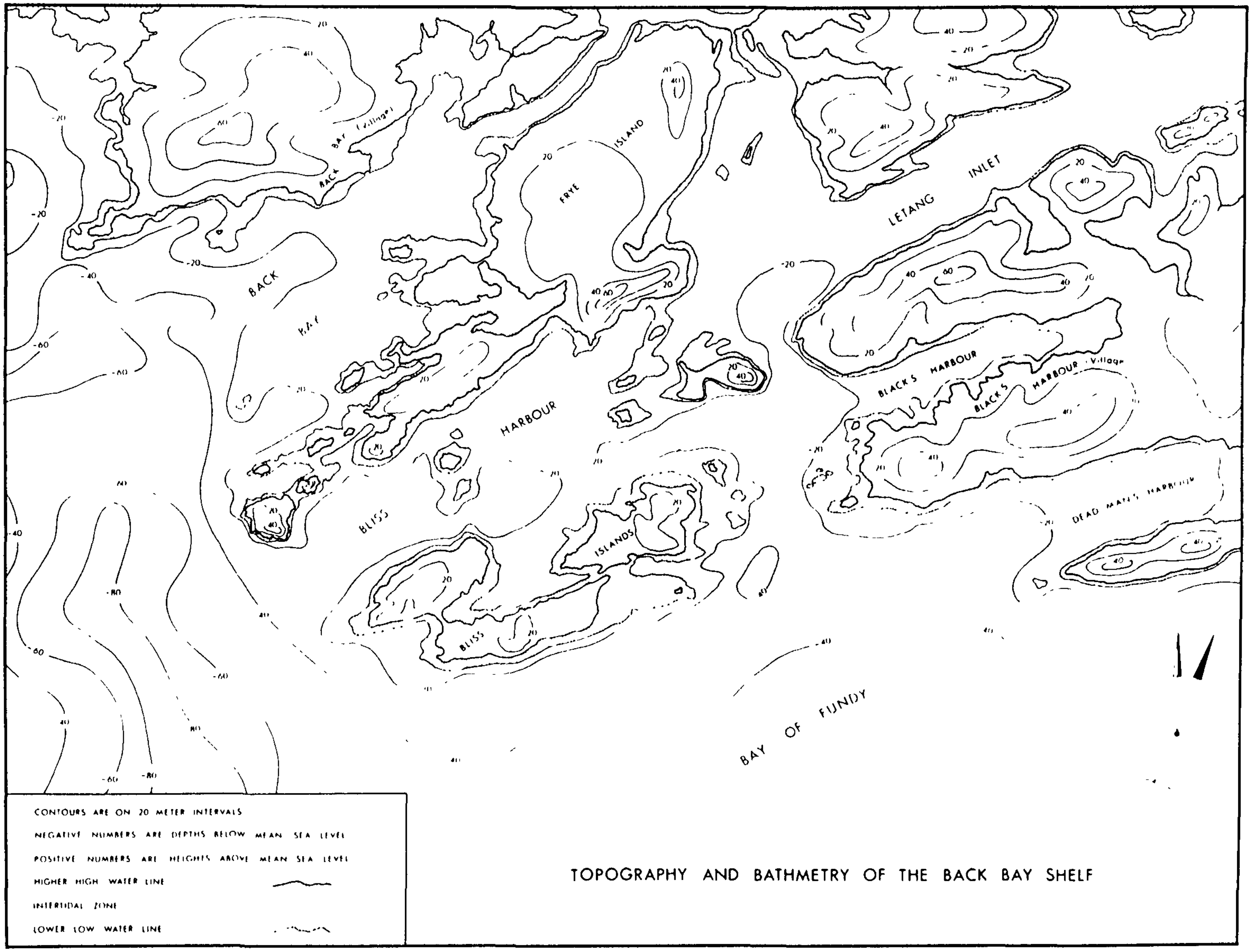
In this chapter I present a brief description of the Bliss Islands, and summarize archaeological research conducted on the islands prior to the Bliss Islands Archaeology Project.
Against this background I describe the Phase I (1983) season of field work conducted by the Bliss Islands Archaeology Project. Conclusions and hypotheses derived from the Phase I field work and lab analyses are presented as a background to the description of the second season of field work.

Description of the Bliss Islands:

The Bliss Islands group consists of three connected islands which form the southeastern boundary of Bliss Harbour, a shallow sheltered body of water located at the mouth of the Letang estuary (Figure 2-1). The islands are ca. 1km offshore to the southeast of Pea Point, and are separated from the mainland by a narrow, but relatively deep channel which leads into Black's Harbour. To the southeast of the islands is the mouth of the Bay of Fundy. The islands are located at longitude 66°50'W and latitude 45°01'N.

Figure 2-1: Physiography of the Back Bay Shelf.

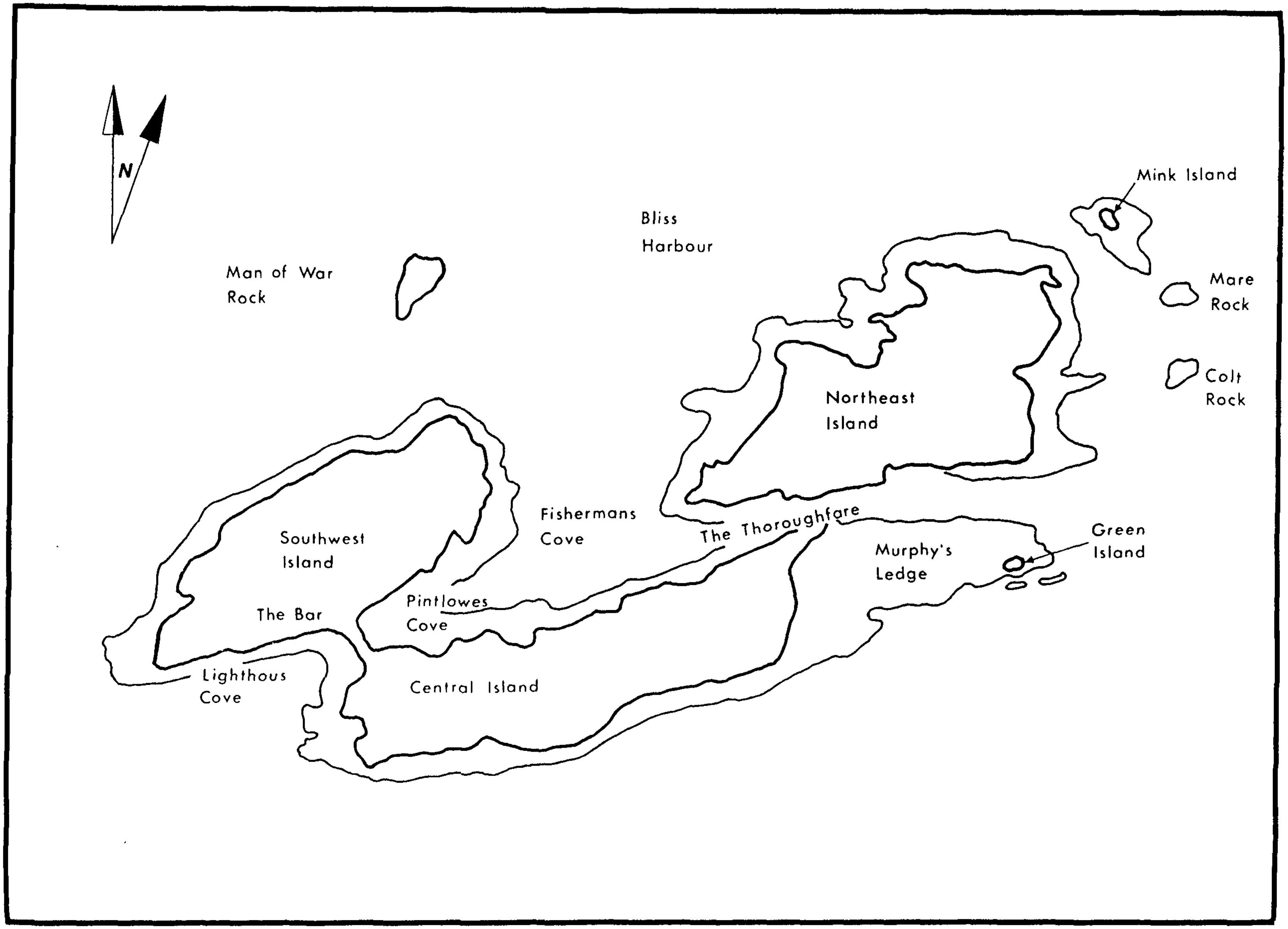
****
LIVING CLOSE TO THE LEDGE



TOPOGRAPHY AND BATHMETRY OF THE BACK BAY SHELF

Figure 2-2: Place names on the Bliss Islands.

****
LIVING CLOSE TO THE LEDGE


N
Mink Island
Bliss
Harbour
Man of War
Rock
Mare
Rock
Colt
Rock
Northeast
Island
Fishermans
Cove
The Thoroughfare
Southwest
Island
Green
Island
Murphy's
Ledge
Pintlowes
Cove
The Bar
Lighthous
Cove
Central Island

There is no permanent community on the Bliss Islands at present. The nearest mainland communities are Black's Harbour and Back Bay.

Figure 2-2 shows the terms by which various areas of the Bliss Islands will be referred to in this study. Some of these terms, such as Fisherman's Cove and Murphy's Ledge are official place names used on marine and topographic charts; others, such as 'the bar', 'the thoroughfare', and 'Spider Cove' are either terms of convenience referring to local topographic features, or unofficial names of places used by local people.

The weather patterns on the Bliss Islands are typical of those of the Quoddy region generally. The Quoddy region is characterized by a continental climate moderated by maritime influences. Summers are cool, and winters moderate. The air is humid; precipitation and overcast weather are common throughout the year, particularly in the winter. Winds from the ocean (usually northeast or southeast) bring precipitation in all seasons. Gale force winds from these directions are common in winter, but rare in summer; most coastal erosion occurs during winter gales.

In the spring, the Quoddy region is characterized by cool changeable weather. Fog is common in the summer, especially on the islands at the mouth of Passamaquoddy Bay. Autumn brings settled and pleasant weather, and a gradual transition into winter. Prevailing winter winds are from the west and northwest. Heavy snow accumulations are rare, and there is negligible formation of sea ice. Upper intertidal zones ice up in winter during low tide intervals.

The bedrocks of the Bliss Islands are part of the Perry Formation, composed of conglomerates, sandstones, shales, and minor igneous intrusive dykes (MacKay et al. 1978:14). The common bedrocks observed on the islands are conglomerate and shale, the conglomerate being more resistant and producing outcrops, cliffs and high gradient shores, and the shales underlying low marshy areas and low gradient shores. The Northeast and Southwest islands are composed mainly of conglomerate covered by thin glacial till deposits and consequently have relatively high relief. The Central island is lower and has a thicker mantle of glacial till; shale is the predominant bedrock on the western shore of the Central island. The Northeast and Central islands are joined by a narrow, shallow thoroughfare which is exposed between two extensive intertidal zones at low tide. This thoroughfare has formed very recently in an area of shale bedrock; as recently as a century ago these two islands were permanently joined by a narrow isthmus of land. The Central and Southwest islands are joined by a high narrow bar of cobbles and gravel which is inundated only at the highest water levels.

Drainages on the islands take the form of seeps and streams. On the Northeast and Southwest islands short streams drain the

Plate 2-1: An air photo of the Bliss Islands taken at near high tide.

freshwater marshes; the water in these streams is red in colour and has a high organic content. On the Central island a significant source of clear 'white' water occurs toward the western end where ground water is trapped and filtered by the glacial deposits.

The tidal range at the Bliss Islands averages more than 5m (with a maximum of 8m), resulting in extensive and complex mixed substrate intertidal zones. Rock and boulder intertidal and subtidal substrates are common on all shores except in Fishermans Cove and Pintlowes Cove, where a dense gravelly mud has formed. Sandy substrates are rare (MacKay et al. 1978:20-22). Tide pools are present on Murphy's Ledge, at which an area of more than 1km2 is exposed at low tide.

The waters around the islands are less clear than those in Passamaquoddy Bay and the West Isles; this may be due to sediment inflow from the Letang estuary. However, fresh water influence is minimal due to tidal mixing.

Currents run to the eastern shores of the islands (MacKay et al. 1978:24), and erosion is most extreme on these shores because they are exposed to the open ocean. Bliss Harbour is relatively shallow, with an average depth of 15m; on the Bay of Fundy side of the islands the bottom falls away rapidly to much greater depths. Terrestrial elevations on the Bliss Islands are all 20m or less.

****

LIVING CLOSE TO THE LEDGE

There are five distinguishable habitats present on and around the islands. These are: (i) coastal forests; (ii) freshwater marshes; (iii) salt marshes; (iv) the intertidal zone; and (v) the subtidal zone (Plate 2-1).

The islands are almost completely forested except where they have been artificially cleared. The forest is typical of coastal forests in the area (see Hinds 1983:269), being dominated by coniferous trees such as white spruce, black spruce and balsam fir. In its natural state this forest is almost impassable due to blowdowns and debris, because forest fires are rare in the fog zone of the coast.

Freshwater marshes occur in depressions in the bedrock above the high water line and are generally overgrown by conifers and an undergrowth of marsh plants. The largest naturally clear areas are two salt marshes located on the Northeast island. The largest of these completely bisects the island, and contains a large brackish pond. The salt marshes are bounded at their shoreward edges by barrier beaches.

The Bliss Islands are large enough to support large terrestrial animals. Deer are present, and informants have observed moose wintering on the islands.1 Beaver have also been observed occasionally. Small animals such as mink are present, and mice and voles abound. It appears that reptiles and amphibians are not present. Avian wildlife on the islands is abundant as it is in most areas of the Quoddy region (Christie

1983). Gulls, herons, and other shorebirds were observed during the field season, and informants stated that ducks are common during the migration seasons.

The Bliss Islands are characterized by high marine productivity and diversity. Intertidal productivity is especially high on the rocky shores of the Northeastern and Southwestern islands, and on Murphy's Ledge. Periwinkles, sea urchins, and mussels are particularly common. There are no major clam beds on the islands but soft-shelled clams are common in the thoroughfare. A wide variety of other shellfish and bony fish are present around the islands. Seals are common on the ledges around the Northeast island. It is difficult to generalize about such a complex environment, but summer/autumn is probably the season of maximum productivity of all habitats on the islands.2

Previous archaeological research on the Bliss Islands:

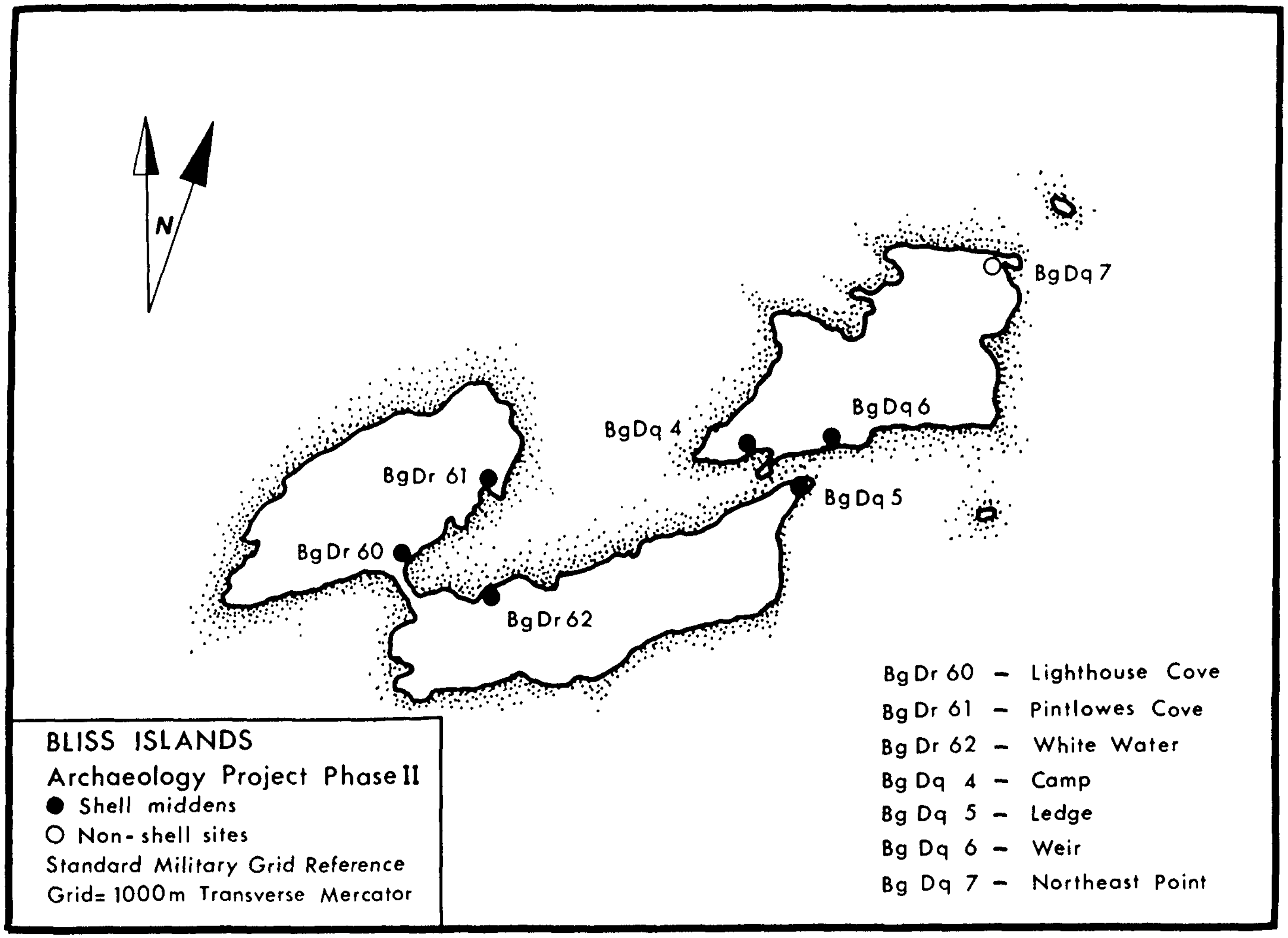
The earliest recorded archaeological research on the Bliss Islands was conducted in 1869 by S.F. Baird, an associate of the U.S. National Museum (Baird 1881; Black 1985a:26; Black and Hale 1986). Baird tested two sites on the Bliss Islands, but it is not clear from his descriptions which two sites these were. However, his site #8 probably refers to the Pintlowes Cove site (Black 1988e:116), and his site #9 may refer to the Weir site (Black

1985a:26). Baird described the Bliss Islands sites as poor in both artifactual and vertebrate faunal remains.

No further archaeological activity took place on the islands until a coastal site survey of the Back Bay and Letang Harbour areas was conducted in 1981 (Davis and Ferguson 1981). Six shell middens and one non-shell prehistoric site were found at that time (Figure 2-3). Davis and Ferguson suggested that the Lighthouse Cove and Pintlowes Cove sites are prehistoric ("Ceramic Period") middens, although they did not recover any diagnostic artifacts or cultural material from either. They observed 'charcoal staining and layering' in the White Water site, but no artifacts, and speculated that this site might represent an historic shell deposit.

Davis and Ferguson determined that the Camp site is definitely a prehistoric site, because they found part of a ground stone axe blade and several other lithic and ceramic artifacts on the erosional face of the site. They also suggested that the Ledge site is a prehistoric site, although no artifacts were found there. Surprisingly, they equivocated concerning their interpretation of the largest shell midden, the Weir site, although they did note that it conforms in many respects to other prehistoric shell midden sites in the Quoddy region. The Northeast Point site consisted of a single projectile point and two flakes of lithic debitage, which had eroded into the

Figure 2-3: Locations of prehistoric archaeological sites on the Bliss Islands.


N
Bg Dq 7
Bg Dq 6
Bg Dq 4
Bg Dq 5
Bg Dr 61
Bg Dr 60
Bg Dr 62
BLISS ISLANDS
Archaeology Project Phase II
Shell middens
Non-shell sites
Standard Military Grid Reference
Grid= 1000m Transverse Mercator
Bg Dr 60 – Lighthouse Cove
Bg Dr 61 – Pintlowes Cove
Bg Dr 62 – White Water
Bg Dq 4 – Camp
Bg Dq 5 – Ledge
Bg Dq 6 – Weir
Bg Dq 7 – Northeast Point

intertidal zone, apparently from a thick peat deposit covering a bedrock outcrop.

Prior to Phase I of the Bliss Islands Archaeology Project, no definitely historic archaeological sites had been designated on the islands.

Summary of the 1983 field work:

In 1983 I was given an opportunity to continue my research into the nature of Quoddy region shell midden sites. The research strategy chosen for what became Phase I of the Bliss Islands Archaeology Project was developed by Chris Turnbull and myself before the Bliss Islands were chosen as the focus of the project. My aim in planning the research was to investigate the cultural history and prehistoric settlement patterns of the Quoddy region by excavating a series of various types of sites in close proximity to one another, rather than by excavating only large shell midden sites, the strategy used in all of the previous Quoddy region archaeological research (see, for example, Bishop 1983a; Pearson 1970; Sanger 1971). Rather than producing a single site report, my aim was to produce a 'micro-regional' analysis of one delimited area of the Quoddy region.

The Bliss Islands were chosen because of the high density of prehistoric sites recorded on the islands during the 1981 survey, because access to the islands is relatively easy, and because my crew and I could live on the islands while conducting field work, rather than having to commute daily over the water.3 The choice of the Bliss Islands as the project locale allowed several subsidiary goals to be added to the research. For example, I could develop a culture historical sequence for the Back Bay shelf, an area physiographically and ecologically somewhat different from the previously researched areas of the Quoddy region. The choice of an insular locale for the study was also prompted by my continuing interest in subsistence patterns in the insular Quoddy region and by my desire for material to compare to the assemblages from the Partridge Island site (Bishop 1983a; Black 1983).

During Phase I, I concentrated on the shell midden sites. All six shell middens were mapped and surface collected, and test units were excavated at three of these. In addition, the islands were surveyed for further archaeological resources. I recorded five historic sites (see Black 1985a:22-23), but found no additional prehistoric sites.

Four 1m2 test units were excavated at the Camp site, 2 1m2 units at the Weir site, and 1 1m2 unit at the Ledge site.4 Time constraints did not allow the testing of the other shell middens; however, matrix samples were collected from them. The eroding edge of the Northeast Point site was examined, but no artifacts were found and the site was not tested. More than 3000 specimens of prehistoric cultural material were recovered during the Phase I field work; a summary of these specimens is presented in Table 2-1.

This material was analyzed at McMaster University under my supervision during the 1983/84 academic year. The results of Phase I have been summarised in a manuscript (Black 1985a), and several papers (Black 1984c, 1987; Black and Turnbull 1986).

I concluded that the six shell midden sites occurred as two clusters, each comprised of three sites. The three middens located on the thoroughfare between the Northeast and Central islands (the BgDq cluster) are definitely prehistoric. One of these, the Weir site was radiocarbon dated to the Late Woodland period (1280+/-60bp; B-8198). The other two sites in this cluster, the Camp site and the Ledge site, were dated to the protohistoric period (300+/-50bp; B-8196 and 380+/-50bp; B-8197, respectively). In addition, the Camp site contains historic components dating late 19th and 20th centuries. I concluded that, while similar to other sites of the same age in terms of structure and location, the Bliss Islands sites appeared to contain relatively few artifacts, and, in particular, appeared to almost completely lack prehistoric ceramics. However, the preservation of faunal remains and bone tools is excellent in the sites. The radiocarbon dates suggested that the Bliss Islands were occupied only during the later part of the prehistoric period. My

TABLE 2-1: Prehistoric cultural remains recovered from the Bliss Islands during the 1981 survey and the Phase I field work.

Provenience:		Specimen Types:					
site name:	site number:	lithic artifacts:	ceramic artifacts:	organic artifacts:	faunal bones:	matrix samples:	Site Totals:
Camp:	BgDq4	58	0	0	420	2	480
Weir:	BgDq6	7	4	6	2662	7	2686
Northeast Point:	BgDq7	3	0	0	0	0	3
Ledge Site:	BgDq5	0	0	0	0	2	2
Lighthouse Cove:	BgDr60	0	0	0	0	1	1
Pintlowes Cove:	BgDr61	0	0	0	0	1	1
White Water:	BgDr62	0	0	0	0	1	1
Total number of specimens:							3174

interpretations were tentative due to the small volume of material excavated.

The other (BgDr) cluster of sites includes the smaller shell middens located around Pintlowes Cove on the Southwest and Central islands. No diagnostic artifacts were found on these sites and they were not radiocarbon dated. I concluded that they might represent historic shell deposits.

In the preliminary report on the Bliss Islands Archaeology Project, I made four recommendations concerning the Bliss Islands sites (Black 1985a:58-59). I noted that the Weir site and the Camp site are major archaeological resources, and recommended that they be extensively excavated. I suggested that a small amount of additional testing be conducted at the smaller shell midden sites to evaluate the chronological position of these and similar sites. I recommended further survey work on the islands, aimed at discovering additional, non-shell midden sites. Finally, I advised that the historic archaeology of the islands, while potentially of great interest, be de-emphasized until the rapidly eroding prehistoric coastal sites had been adequately excavated and documented.5

Preliminary subsistence analysis of the Weir site:

Early in 1985 I undertook a preliminary analysis of the subsistence pattern represented at the Weir site, based on the faunal assemblage recovered from the site in 1983.6 In this study I used an ecological measurement known as niche width to assess the degree of specialization of the Weir site subsistence pattern, and compared the results to those from a similar study of the Wheeler's site shell midden in Massachusetts (Barber 1982).

The methodological aspects of the niche width analysis7 are detailed in Chapter 6 of the present volume. The reliability of the results of the preliminary niche width analysis is questionable due to the small sample size (2m3) and some unwarranted assumptions (for example, the Weir site was treated as a single component). However, I found the results provocative.

The niche width measurements for the Weir site indicated a relatively specialized subsistence strategy. The Phase I faunal sample indicates that approximately 65% of the Weir site faunal assemblage consists of shellfish; most of the remainder consists of deer and seal. I concluded that shellfish (especially soft-shelled clams and sea urchins) were intensively exploited at the Weir site. Also, the data could be interpreted to suggest a bifocal subsistence strategy, as Barber (1982:95-98) has suggested for the Wheeler's site. However, because of a lack of seasonality information and structural details from the Weir site, I was not able to determine if Barber's (1982:98-99) seasonally specific, functionally specialized, shellfish processing station model of shell midden formation could be applied to the Weir site.

Questions and hypotheses:

Three factors conditioned my decision to conduct further archaeological research on the Bliss Islands. First, the data I collected in 1983 were not extensive enough to produce the type of micro-regional analysis which I had planned, although the field work suggested that the Bliss Islands provide an excellent site inventory upon which to base such a study. Second, the threat posed by coastal erosion to the Bliss Islands prehistoric sites is extreme. Third, and most significant, was my recognition of the uniqueness of the Weir site.

The Weir site is the only known large, multicomponent, stratified shell midden in the Quoddy region which has not been disturbed by historic agricultural and/or construction activity. The material from the Phase I test excavations suggested that it contains a uniquely detailed record of Quoddy region prehistory. One of the artifacts recovered, a bone harpoon or spear point (Black 1985a:46, 116; Robins and Black 1988:141, 159), suggested to me that the basal component at the site might be Late Archaic in age.

Notes:

1. The informants I refer to occasionally in the dissertation are the Mitchell brothers, Murchie, Thomas, and Samuel, Dave Cook and Tony Cook, and Arthur Leslie, all of Back Bay, N.B., who kindly shared their knowledge of the islands with me.

****
LIVING CLOSE TO THE LEDGE

2. More complete descriptions of the Bliss Islands may be found in Black (1985a:17-21, 1988a).

3. During my research on Partridge Island a great deal of down time resulted from weather conditions which did not permit crossing the water (Black 1981).

4. The locations of these units are shown on the site maps in Appendix A.

5. Additional discussions of the Phase I research may be found in Black (1985a, 1987, 1988a).

6. This report was subsequently published as Black (1988b).

7. This is sometimes referred to as niche breadth analysis (e.g. Levin 1968); I have followed Hardesty's (1975:74) terminology as it is most commonly cited in the anthropological literature.

Blank page inserted to maintain continuity.

CHAPTER 3:

THE BLISS ISLANDS ARCHAEOLOGY PROJECT, PHASE II.

"strata... as a complex patchwork in isolated basins
--the bane of any stratigrapher's existence."
(S.J. Gould, in Time's Arrow, Time's Cycle)

In this chapter I summarize the field work undertaken during Phase II of the Bliss Islands Archaeology Project, and briefly describe each of the prehistoric sites in the Bliss Islands site inventory. The purpose of the chapter is to define and describe the stratigraphically meaningful units of analysis to be used, in this study, to address the prehistory and human ecology of the Bliss Islands.

Summary of the Phase II field work:

The Phase II field work was conducted from June 9-August 29, 1986. Essentially, my research plan was to follow up on the recommendations made on the basis of the Phase I field work, and to obtain large enough samples of cultural material from each of the prehistoric sites to allow a micro-regional analysis of Bliss Islands prehistory to be developed.

The research strategies I employed during Phase II reflect both the constraints of responsible archaeological resource management, and my previous experiences in excavating coastal shell middens. I restricted excavations almost exclusively to site areas immediately threatened by erosion. I employed excavation strategies designed to combine the benefits of both wide area and small unit excavation techniques, and to minimize the interpretive problems resulting from noncontiguous excavation units.

Major excavations were undertaken at the Camp site and at the Weir site. These excavations were conducted in blocks of contiguous 1m2 units, rather than using randomly or judgementally placed isolated units. Test excavations were conducted at the Northeast Point, Lighthouse Cove, Pintlowes Cove, White Water and Ledge sites. Matrix and column samples were taken from all of the sites to facilitate quantitative analyses of site structures and contents, and to ensure the recovery of representative samples of invertebrate faunal remains and adequate samples of small vertebrate faunal and botanic remains. In addition, several areas of the shorelines and interiors of the islands were intensively surveyed and/or shovel-test transect sampled.

The excavation and surveying methodologies employed have been described in detail elsewhere (Hale, Finley and Black 1988). Preliminary lab work was conducted concurrent with the field work.

TABLE 3-1: Approximate site and sample sizes for the Bliss Islands prehistoric site inventory.

Provenience:		Site Area:				Site Volume:		
site name:	site number:	site area (sq.m):	phase II sample area (sq.m):	total sample area (sq.m):	proportion:	site volume (cu.m):	total sample volume (cu.m):	proportion:
Camp:	BgDq4	600.0	28.0	32.0	0.05	150.0	10.0	0.07
Weir:	BgDq6	650.0	25.0	27.0	0.04	325.0	18.0	0.06
Northeast Point:	BgDq7	30.0	3.0	3.0	0.10	9.0	1.0	0.11
Ledge Site:	BgDq5	10.0	1.0	2.0	0.20	3.0	1.0	0.20
Lighthouse Cove:	BgDr60	200.0	2.0	2.0	0.01	40.0	1.0	0.03
Pintlowes Cove:	BgDr61	100.0	2.0	2.0	0.02	25.0	1.0	0.04
White Water:	BgDr62	100.0	2.0	2.0	0.02	20.0	1.0	0.05

TABLE 3-2: Prehistoric cultural remains recovered from the Bliss Islands during the Phase II field work.

Provenience:		Types of Materials Recovered:					
site name:	site number:	lithic artifacts:	ceramic artifacts:	organic artifacts:	faunal bones:	matrix samples:	Totals:
Camp:	BgDq4	2194	277	22	2803	36	5332
Weir:	BgDq6	523	355	35	9188	130	10231
Northeast Point:	BgDq7	147	0	1	0	1	149
Ledge Site:	BgDq5	0	0	0	1	2	3
Lighthouse Cove:	BgDr60	5	2	0	5	2	14
Pintlowes Cove:	BgDr61	3	0	1	5	1	10
White Water:	BgDr62	0	0	0	0	1	1
Total number of specimens:							15740

Sample sizes:

Table 3-1 shows the sample sizes excavated from each of the sites during Phase II, and total sample sizes recovered during both phases of the project. These sample sizes are calculated in several different ways: by area, by volume, and by proportions of total site areas and volumes. All of these values are estimates, and have been rounded to the nearest whole number. They reflect the sites as recorded; no attempts have been made to reconstruct site areas prior to the impactl of erosion.

The results vary considerably depending on the method of calculation used. In general, however, a sample size of between 1% and 10% has been recovered from each of the sites, except for the Ledge site; a higher proportion of the latter was sampled due to the very small remaining area of that site.

Table 3-2 shows the numbers of specimens recovered from the Phase II excavations. To date, more than 18,000 archaeological specimens have been recovered from the islands.

The Bliss Islands prehistoric site inventory:

The Weir site (BgDg6)

The Weir site is a large deep shell midden (ca. 650m2 in area and averaging more than 50cm in depth), located on the southeastern shore of the Northeastern island at the Spider Cove end of the thoroughfare (Figure A-1). The site is situated on the western end of an east-west oriented conglomerate outcrop which is being progressively denuded and isolated from the rest of the island by rising sea levels and erosion. Immediately south of the site is a steep rocky intertidal zone; southwest of the site is the relatively low gradient intertidal zone of the thoroughfare. To the west and northwest of the site is a large salt marsh which bisects the Northeast island. Immediately north of the site is a dense stand of coniferous forest (Plate A-1).

The salt marsh is bounded by a barrier beach adjacent to the site. The trunks of large conifers, preserved by saturation, are eroding out of this beach into the intertidal zone. Below the beach a peat deposit of up to 1m in depth forms the intertidal substrate. These phenomena indicate that the salt marsh is a relatively recent development, and that while the Weir site was occupied, the salt marsh and parts of what is now the intertidal zone were probably covered by forest and freshwater marsh.

Spider Cove is at the eastern end of the bedrock outcrop. This is the location of the herring weir for which the site is named.

The cultural deposits at the Weir site consist of four 'heaps', each located on a separate part of the outcrop. Since 1983, the last remnants of the most westerly and exposed of these heaps (Black 1985a:41, 95) has been completely washed away. Two of the other heaps are now seriously threatened by erosion. Shell deposits are exposed and eroding on the western, southern, and part of the eastern edges of the site.

Much of the surface of the Weir site is covered by a dense stand of brambles (Rubus sp.), but the trunks and roots of dead conifers among the brambles indicate that this part of the site was covered by forest until quite recently. The northernmost area of the site is still forested. Two partly overgrown tractor roads are present in the forest; one of these crosses the northeastern corner of the Weir site, and has caused a small exposure of shell the surface. No historic artifacts have been found at the site; this tractor road is the only indication of historic disturbance.

The plan of the block of units excavated at the Weir site during Phase II, and the system used to designate provenience units, are shown in Figure A-3. Figure A-4 shows a cross section through the excavation block illustrating the complex stratification encountered in the site, and indicating how the provenience units (excavation units and column samples) intersect the stratigraphy. This profile also shows the locations of the 30 column samples analyzed for this study, and the locations of 4 charcoal samples analyzed by the radiocarbon dating technique. Plate A-2 is a photograph of another cross section of the excavation block showing the very complex but distinctive appearance of cultural stratification in the Weir site.

The stratigraphy of these deposits has been analyzed using the techniques developed by Harris (1975, 1977, 1979a, 1979b, 1984); the methods used are similar to those used to analyze the Partridge Island shell midden (Bishop and Black 1988:20-21; Black 1983:45-63; in press a, in press b). Depositional sequences were determined for each of the excavation units, based on the plans, profiles, and layer descriptions. These sequences were then correlated to produce a schematic stratigraphic sequence for the entire excavation block (Figure A-5).

The Weir site stratification consists of at least 12 distinct major layers, and as many as 100 individual layers and lenses. In this study, the site is considered in terms of more inclusive units, referred to as stratigraphic components. I have defined a stratigraphic component as a subdivision of site stratigraphy in which several layers and/or cultural features are grouped according to similarities in stratigraphic position and structural components (Bishop and Black 1988:21; Black 1983:167, in press b). A structural component is a constituent of an archaeological deposit such as shell, gravel, bone, or humic soil (Black 1983:167; McManamon 1982:113).

Three natural stratigraphic components (labelled by capital letters in Figures A-4, A-5 and A-6) and four cultural stratigraphic components (labelled by arabic numerals in Figures A-4, A-5 and A-6) have been defined. Figure A-4 shows how these components relate to the actual stratification in the site. Figure A-5 shows the depositional sequence for the excavation block schematically, and indicates how the radiocarbon dates for the site relate to the stratigraphy. The dates indicate that the site was occupied from ca. 2400bp to ca. 1200bp.2

Descriptions of each of the Weir site stratigraphic components follow:

stratigraphic component A

This stratigraphic component consists of an upper layer of loose, light brown peat soil covering the surface of the site, and a lower layer of compact, dark red peat soil, immediately above the archaeological deposits. These layers include the partially decomposed remains of mosses, grasses, shrubs, tree trunks and tree roots. They represent, respectively, the modern active soil layer at the site, and a deposit of forest soil which has accumulated since the final cultural occupation of the site.

The peat deposits are relatively acidic (average pH 4.43), presenting a poor preservational environment for shell and bone. No cultural materials were found in the peat.

stratigraphic component B

This component consists of a thin, sporadic layer of yellow-grey sandy/silty subsoil which covers parts of the bedrock outcrop and underlies portions of the archaeological deposits. This material represents glacial or glacio-marine deposition probably dating to the late Pleistocene. It has subsequently been altered by pedogenic processes, and is slightly basic (pH 7.7). No cultural materials have been found which are definitely associated with the subsoil.

stratigraphic component C

The bedrock outcrop underlying the site has been designated as stratigraphic component C. The bedrock consists of resistent Upper Devonian conglomerate, composed of Silurian volcanic and sedimentary pebbles and cobbles in a finer reddish colored matrix. This outcrop takes the form of a roche moutonnée formed by Pleistocene glaciation.

stratigraphic component 1

This stratigraphic component consists of a thin layer of black, greasy humic soil, associated with a few small lenses of cultural gravel3 and clam shells located stratigraphically within or below the black soil layer. This component covers most of the subsoil and bedrock underlying the archaeological deposits. The black soil is somewhat basic (average pH 7.95) and is usually saturated due to groundwater movement on the surface of the bedrock.

Stratigraphic component 1 contains artifacts, animal bones, ash and charcoal. It may be a completely anthropogenic deposit, or it may represent a natural soil horizon altered by cultural activity during the initial occupation of the site and by subsequent burial and pedogenic processes. The cultural material in this component may represent a single occupation or a palimpsest4 resulting from several occupations.

Stratigraphic component 2

Stratigraphic component 2 is a thicker and more distinctly stratified deposit than stratigraphic component 1, consisting of two internally stratified cultural gravel living floors, and a series of clam and sea urchin shell lenses and midden deposits interstratified with, or immediately adjacent to the floors. These layers only partially intervene between stratigraphic components 1 and 3.

This stratigraphic component is almost completely anthropogenic. The shell deposits are quite basic (average pH 8.30) and consist mainly of whole and coarsely broken shells. The floors are less basic (average pH 7.47) and contain finely fragmented shell, charcoal and ash deposits resulting from the construction of hearths. Both the living floors and the shell deposits contain artifacts and animal bones. Stratigraphic component 2 probably represents a considerable period of continuous occupation, or sequential re-occupations of the site.

stratigraphic component 3

Stratigraphic component 3 includes the bulk of the cultural deposits in the Weir site. It is composed of a series of clam and sea urchin shell, and clam and mussel shell middens; inter-stratified with these middens are a series of basin shaped, internally stratified, cultural gravel living floors of varying sizes and depths. This component is almost completely anthropogenic, and represents a considerable period of sequential re-occupations of the site.

The shell middens in this component vary from layers of mostly complete shells to layers of highly fragmented shells, probably reflecting differences in the intensity of cultural activity and weathering to which layers have been subjected (cf. Muckle 1985). The structures of the living floors vary from ones consisting almost completely of cultural gravel to those which contain substantial inclusions of black humic soil, ash, charcoal and fragmented shell. The floors and middens are quite basic (average pH 8.50), and artifacts and faunal bones occur in both floor and midden contexts. Artifacts and evidence of hearth construction are especially common near the surfaces of the living floors.

****
LIVING CLOSE TO THE LEDGE

stratigraphic component 4

This stratigraphic component represents a complex palimpsest of cultural and natural events and processes. After the final occupation of the middens and floors in stratigraphic component 3, a natural soil horizon of fine black humic soil consisting mainly of worm and insect casts began to form on the surface of the site. During the formation of this soil the surface of the site may have been covered by low herbaceous or shrubby vegetation.

The large amount of charcoal and carbonized botanics in stratigraphic component 4 suggests that the vegetation was burned off the surface of the site, either naturally or through human intervention. This may have occurred more than once.

Subsequent to this initial soil formation episode, cultural activity took place on the surface of the site. Several basin shaped pit features were excavated through the black soil into the underlying shell deposits. This resulted in buried areas of sterile black soil, and deposits of shell mixed with black soil representing spoil from the pit features. The features subsequently became filled with deposits of gravel and soil.

Thin layers of cultural gravel were spread over some areas. Small circular configurations of pebbles and cobbles were also constructed on the surface of the site. Another brief episode of black soil formation apparently took place after the final cultural occupation of the site and before the initial accumulation of peat soil. It is possible that stratigraphic component 4 has been disturbed by the growth of tree roots through it at the time that the peat deposit began to form.

The shell deposits in stratigraphic component 4 are slightly basic (average pH 7.45); however, the humic soil layers are relatively acidic (average pH 5.85). Consequently, the preservation of bone in the humic layers is somewhat poorer than in other parts of the site. Artifacts and bones occur in association with most of the layers and features in this component. It is unclear whether one or several episodes of cultural activity took place during the formation of this relatively shallow stratigraphic component.

The stratigraphic components defined above are based on interpretations of the descriptive stratigraphy of the Weir site. In order to demonstrate the distinctiveness of these components quantitatively, column samples from each component were analyzed. In Figure A-6 the contents of the stratigraphic components are plotted on a triangular co-ordinate graph according to the proportions of each of the three main structural components in the site in each of the analyzed column samples. The structural components considered are gravel (mineral particles greater than 3mm diameter), shell (all shell particles of any size5), and fine particles (all organic and mineral particles smaller than 3mm diameter).

There are essentially three types of layers present in the site: i) humic soil layers, ii) gravel floor layers, and iii) shell midden layers, although, in fact, most of the layers in the site are composed of combinations of these structural components. These three types of layers cluster in separate corners of Figure A-6, and there is some overlap in composition between the stratigraphic components. However, in general, the matrix analysis confirms their distinctiveness.

Stratigraphic component 1 and 4 humic layers are similar in composition; this may reflect similarities in the conditions under which they formed. However, because of the separate stratigraphic positioning of these components, there is little possibility of confusing their contents. Stratigraphic component 2 and 3 living floor deposits are similar, but may be distinguished because: i) component 2 floors are lenticular in shape while component 3 floors are basin shaped; ii) component 2 floors include more shell, while component 3 floors include higher proportions of gravel and/or humic soil, and little or no shell; and iii) the major component 3 floors are stratigraphically higher than the major component 2 floors, and are separated from them by some of the component 3 shell middens.

Stratigraphic component 2 and 4 middens are composed mainly of clam and sea urchin shell. Component 2 middens are small and consist almost completely of shell; in contrast, component 4 shell deposits contain significant proportions of humic soil and some gravel. Stratigraphic component 3 middens contain both clam and sea urchin dominated deposits and clam and mussel shell dominated deposits. They vary in composition between the extremes represented by the middens in the higher and lower components. However, they are distinctive in that they contain significant proportions of gravel. The higher proportions of mussel shell and gravel in component 3 middens are probably related phenomena, since the harvesting of mussels can be expected to result in gravel attached to byssal threads being deposited on site.

Stratigraphic components 1, 2, 3 and 4 in the Weir site also contain quantitatively and qualitatively distinctive artifactual and vertebrate faunal assemblages. These assemblages are reported in detail in Chapters 5 and 6, respectively.6

The Camp site (BgDq4)

The Camp site is a large shallow shell midden (ca. 600m2 in area and averaging ca. 25cm in depth), located on the southeastern shore of the Northeastern island, on the Fishermans Cove side of the thoroughfare (Figure A-7). The site is located in a clear area of low sloping ground between a conglomerate outcrop and the high water line. At both ends of the site are conglomerate cored knolls, between which is an area of slate bedrock covered by glacial deposits. The site is situated on these glacial deposits.

Vegetation in the clear area consists of grasses and wild flowers. The area north of the site is covered by forest (Plate A-3).

A number of cabins are located around the perimeters of the site. Two wharfs, one abandoned, and one still in use, are located adjacent to the site. There are large numbers of 19th and 20th century historic artifacts throughout the site. Shallow wells have been dug at several points in and adjacent to the shell deposits. Informants have indicated that the area may have been tilled and planted as a garden during the last century; below the sod layer, the site resembles horticulturally disturbed shell deposits (cf. Schiffer 1987:130).

Shell is eroding at the shore line where a low wave cut scarp rises above the intertidal zone. Shell is also exposed on the surface of the site due to historic disturbances. Thus, the prehistoric remains in the Camp site have been seriously disturbed by natural and cultural processes.

Shell midden deposits are located toward the rear of the site, and living floors toward the front of the site. During the Phase II field work a large block of 1m2 units was excavated in the central shoreward part of the site in an area containing several living floor deposits. The plan of this excavation block, and the system used to designate provenience units, are shown in Figure A-8.

Figure A-9 shows the eastern profile of the excavation block. The Camp site is composed of a naturally horizonated soil altered by cultural activity and the addition of cultural materials. Four layers containing cultural materials (layers 1, 2, 4 and 4 in Figure A-9) were recognised during the excavation. In addition, three natural layers (a topsoil and two subsoil layers) are present. The stratigraphic relationships between these layers are shown schematically in Figure A-10.

Descriptions of the natural layers follow:

topsoil layers

These include the sod, and layers 2, 3 and 4. The predominant constituent of all of these layers is a fine black humic soil composed largely of worm and insect casts and partially decayed plant materials. Layer 3 includes considerable amounts of shell in addition to the black soil. Layer 2 includes high proportions of cultural gravel in addition to the black soil. All of these layers are slightly basic (average pH 7.05), and all contain artifacts and bones.

subsoil layers

The first subsoil layer (B1), which directly underlies the archaeological deposits, consists of light brown silt to clay sized particles mixed with gravel. This layer is about 10cm in depth. The second subsoil layer (B2) consists of a compact deposit of reddish orange sand to silt sized particles containing only a trace of gravel. The second layer is about 25cm in depth, and overlies a deposit of highly fragmented slate bedrock.

Both subsoil layers are slightly basic (average pH 7.35), and are probably marine reworked glacial deposits, which are common in the region (Rampton et al. 1984). Layer B1 may be an elluviation horizon. Layer 1 is identical in appearance to layer B1, except that layer 1 contains cultural material.

In order to describe the structure and contents of the Camp site quantitatively, 18 column samples (from columns 3, 6, 8 and 9 in Figure A-8) were analyzed. The methods used are similar to those described for the Weir site. Figure A-11 is a triangular co-ordinate graph on which the column samples have been plotted according to the proportions of the three main structural components (shell, gravel and fine particles) in each.

All of the samples cluster toward the lower right corner of the graph, because all tend to contain relatively high proportions of fine particles and relatively low proportions of shell and gravel. There is considerable overlap in composition between the layers. Layer 1 is very similar in content to the subsoil. Layers 2, 3 and 4 are only partially distinct from one another, and represent a gradation from higher proportions of gravel at the base of the site to higher proportions of fine particles toward the surface of the site.

Apparently the initial cultural occupation at the site took place before any significant buildup of top soil. As a result, some cultural materials are associated with the interface between the subsoil and the topsoil (layer 1). Subsequently, a series of cultural gravel living floors was constructed in the area around the glacial erratic (layer 2). Some topsoil formation may have taken place before the construction of these floors.

The shell middens of layer 3 may have been deposited around the peripheries of these floors, contemporaneous with them. Shell from these middens could have spread over the floors by natural processes during a soil formation episode after their deposition. Alternatively, the shell may have been deposited over the floors during a separate cultural occupation. At any rate, the bulk of the shell in the site is now stratigraphically above the living floors.

Layer 4 represents a period of soil formation on the surface of the site; pedogenic processes have incorporated cultural material into this soil deposit. There is some evidence, in the form of small circular configurations of cobbles, that a prehistoric occupation is associated specifically with this soil layer.

Because of the disturbed nature of the prehistoric deposits in the Camp site, cultural materials from the site cannot be assigned to culturally meaningful units of analysis on the basis of stratigraphic relationships alone. Thus, spatial as well as stratigraphic analytical units have been used to analyze the distributions of the cultural materials. Four spatial units (areas I, II, III, and IV in Figure A-12) have been designated. These areas are described below:

area I

This area includes 8m2 in the northwestern quadrant of the excavation block in which layers 3 and 4 contain high proportions of shell, and layers 1 and 2 are only slightly represented.

area II

This area includes 7m2 in the northeastern quadrant of the excavation block. In this area layers 3 and 4 contain high proportions of shell, there is a substantial living floor feature in layer 2, and a high density cultural material in layer 1.

area III

Area III consists of 6m2 in the southwestern quadrant of the excavation block in which layers 3 and 4 contain high proportions black soil, layer 2 contains substantial living floor deposits, and layer 1 is only slightly represented.

area IV

Area 4 includes 9m2 in the southeastern quadrant of the excavation block centered around a glacial erratic which takes up much of excavation unit A4. In this area layers 3 and 4 contain small amounts of shell, layer 2 contains substantial living floor features, and there is a high density cultural material in layer 1.

Figure A-12 also shows the locations of charcoal samples from this excavation block analyzed by the radiocarbon technique. The dates suggest that the prehistoric materials in this site date from at least 1700bp until the protohistoric period (ca. 350 years ago).2

The layers observed, and the areas designated in the Camp site contain quantitatively and qualitatively distinctive artifactual and vertebrate faunal assemblages. These assemblages are presented in detail in Chapters 5 and 6, respectively.6

The Northeast Point site (BgDg7)

The Northeast Point site is located on a narrow neck of land near the northeastern tip of the Northeast island (Figure A-13). The location of the site is a low saddle of land between two higher bedrock cored knolls. The surface of the site is covered by grasses, weeds and low shrubs, while the knolls on either side of it are covered with stands of fir and spruce (Plate A-4). There is a fresh water source within 20m of the site.

The Northeast Point site is subject to severe marine erosion from two directions. A few historic artifacts have been found in the vicinity, but there is no significant historic component, and the site has not been subject to historic disturbance.

During Phase II, 3 contiguous 1m2 units were excavated adjacent to the eroding shore line (Figure A-14). A number of shovel-tests were also carried out in an attempt to delineate the limits of the site. The Northeast Point site consists of a thin, stratified, living floor deposit sandwiched between a bedrock outcrop and a deep peat soil deposit (Figure A-14). The living floor consists of lenses of cultural gravel, ash and charcoal, and greasy black organic soil. The site was deposited on what may have been a forest soil deposit represented by layers B1 and B2 in Figure A-14. The layers in which most of the cultural material is located, numbers 2 and 3 in Figure A-14, consist predominantly of organic soil mixed with pebbles and gravel (Figure A-15).

There are no shell midden deposits at the site and the cultural layers are fairly acidic (pH 5.6). As a result virtually no faunal remains have been preserved. However, a microscopic analysis of a matrix sample from one of the floor deposits has revealed the presence of very small fragments of calcined bone, shell, and shellfish periostrachum.

The prehistoric artifact assemblage from the site consists of lithic artifacts and debitage, and one organic artifact (the latter apparently preserved only because it is extensively charred). The site has been dated to ca. 1500bp.2 I have interpreted the Northeast Point site as representing a single prehistoric component.6

The Lighthouse Cove site (BgDr60)

The Lighthouse Cove site is an extensive but shallow shell midden, composed of soft-shelled clams and a few common periwinkles, located on the cliff line overlooking the bar and Lighthouse Cove (Figure A-18). The site consists of a naturally horizonated soil deposit altered by the addition of cultural materials (Figure A-15). It contains prehistoric ceramics and lithics, vertebrate faunal remains, and an historic component. No definite cultural features have been identified at the site.

This site is not subject to marine erosion; nevertheless, it presents a number of interpretive problems because of natural and cultural disturbances. There may be two prehistoric assemblages present, one associated with the shell deposit, and one associated with the interface between the subsoil and the shell deposit. It is difficult to determine which faunal remains are prehistoric and which are historic.

The site has not been radiocarbon dated because of the high potential for contamination of prehistoric charcoal in this type of context. For the purposes of this study, I have interpreted it as representing a single prehistoric component; the sample size is too small to justify an attempt to subdivide it (see also Black 1985a:28-29, 1988d:100-115).

The Pintlowes Cove site (BgDr61)

The Pintlowes Cove site is a relatively small, narrow, strip of shell midden, consisting exclusively of soft-shelled clams, deposited between the base of a low conglomerate outcrop and the edge of a small salt marsh on the southern shore of the Southwestern island (Figure A-19). The long axis of the site is oriented perpendicular to the shore line, and, thus, it has been only slightly impacted by marine erosion.

The main occupation layer consists predominantly of organic soil mixed with broken clam shells (Figure A-15). It appears that the midden was deposited on a pre-existing soil layer at a time when the water level in the marsh was lower than at present; the subsequent rise in water level has saturated portions of the site and caused the deposition of an iron oxide horizon in the midden.

The Pintlowes Cove site contains prehistoric lithic and organic artifacts, and vertebrate faunal remains, but no cultural features. A few historic artifacts are present, but there appears to have been little historic disturbance of the site.

The site has not been radiocarbon dated because insufficient wood charcoal was recovered from the test excavations, and the potential for contamination by modern charcoal is present. I have interpreted it as representing a single prehistoric component (see also Black 1985a:29-30, 1988e:116-136).

The Ledge site (BgDg5)

The Ledge site is located on the northeastern tip of the Central island at the high water line adjacent to Murphy's Ledge (Figure A-20). It consists of two small shallow isolated patches of shell midden, composed of soft-shelled clams, mussels, sea urchins and other invertebrate species (Figure A-15), sandwiched between bedrock outcrops and peat soil deposits. The patches have been designated as areas A and B; area A contains a living floor feature as well as midden deposits. Both areas have been tested.

The Ledge site has retained evidence of cultural stratification in spite of the growth of fir trees over the site, and periodic inundation and erosion. The site contains no prehistoric artifacts and virtually no vertebrate faunal remains. Nevertheless, I have interpreted it as a single component prehistoric site. Although a few modern artifacts have been washed onto its surface, the site does not contain an historic component and has not been disturbed by historic activity (see also Black 1985a:39-41, 1988c:83-99).

****
LIVING CLOSE TO THE LEDGE

The White Water site (BgDr62)

The White Water site is a shallow, but relatively extensive shell deposit, comprised almost exclusively of soft-shelled clams, located in a low-lying marshy area on the southern shore of Pintlowes Cove (Black 1988a:128). The deposit has been seriously impacted by periodic inundation and erosion. No definite prehistoric or historic cultural material, or vertebrate faunal remains, have been recovered from the site, and no cultural features have been observed in it.

The Pintlowes Cove site has not been radiocarbon dated because no charcoal has been recovered from it. It may represent an historic baiter's mound, or it may be associated with the occupation of the nearby cabins. Because of the equivocal nature of this shell deposit, I have decided to exclude it from further analyses of Bliss Islands prehistoric archaeology (see also Black 1985a:30-32, 1988a:128-134).

Find spots:

On the basis of the Phase II field work, I have concluded (Black 1988a:172) that there is not a significant 'background' of prehistoric cultural material scattered over the islands as a result of long term overall use of the islands during the prehistoric period. Instead, the 'archaeologically visible' cultural materials are restricted to the known prehistoric sites.

This conclusion is based on three indications: i) artifact finds reported by local informants are from the erosional faces of the known sites; ii) surveying and shovel-testing did not result in finding additional prehistoric sites or find spots; and iii) three seasons of casual and purposive observation of shorelines and inland areas of the islands by professional archaeologists and others have not resulted in the discovery of even a single true find spot (ie., one or a few prehistoric artifacts not associated with other cultural materials and structural features). A single test unit at the Northeast Point site, originally thought to be a find spot, quickly revealed that it contains numerous artifacts and cultural features in a definite stratigraphic context.

Offshore finds:

During Phase II I was privileged to examine a slate ulu which had been discovered several years earlier by scallop fishermen offshore from White Horse Island, about 5km from the Bliss Islands and somewhat further offshore. This is one of a number of ulus which have been recovered from the sea floor in the Maine/Maritimes area (Keenlyside 1984; Turnbull and Black 1988). Slate ulus of this type are usually considered to date to ca. 6000bp. The importance of this find to the present study is that it indicates that the insular Quoddy region was populated much earlier than the earliest radiocarbon dated occupations thus far discovered in the region, and it substantiates the interpretation that Archaic occupations in the region were mainly coastal and have been largely destroyed by rising sea levels.

Historic sites:

Three additional historic sites were recorded during Phase II. I have presented a summary of the chronology of historic occupations on the islands, as they are presently known, elsewhere (Black 1988a:70-72). Historic and archaeological evidence show that historic occupations on the islands span the period from 1783 until the present. Pre-Loyalist Euro-Canadian occupations may have occurred on the islands, but these have not yet been detected archaeologically.

Summary:

My interpretations of the Bliss Islands prehistoric site inventory have changed considerably as a result of the Phase II field work. My initial pessimism about the productivity of the sites, in terms of diagnostic artifacts, has proven to be unfounded. Large numbers of lithic, organic and ceramic artifacts have been recovered from the islands, especially from the two largest sites.

Both the Camp and Weir sites span considerable portions of the prehistoric period. Four of the smaller sites have been shown to contain significant prehistoric assemblages. Only the

TABLE 3-3: Stratigraphically meaningful units of analysis and sample sizes for the Bliss Islands prehistoric site inventory.

Provenience:			Sample Sizes:	
site name:	site number:	analytical unit:	area (sq.m)	volume (cu.m)
Camp:	BgDq4	area I	7.00	2.18
		area II	8.00	2.62
		area III	6.00	1.87
		area IV	9.00	3.09
		layer 4	30.00	3.07
		layer 3	30.00	3.82
		layer 2	30.00	2.47
		layer 1	10.00	0.40
Weir:	BgDq6	stratigraphic component 4	17.00	2.85
		stratigraphic component 3	22.00	6.10
		stratigraphic component 2	16.00	2.93
		stratigraphic component 1	22.00	0.75
Northeast Point:	BgDq7	single component	2.80	0.30
Ledge Site:	BgDq5	single component	2.20	0.55
Lighthouse Cove:	BgDr60	single component	2.10	0.60
Pintlowes Cove:	BgDr61	single component	2.00	0.30

interpretation of the White Water site has remained essentially unchanged throughout the research, and this site has now been dropped from the prehistoric site inventory.

Table 3-3 presents a summary of the 12 prehistoric analytical units defined and compared in this study, and the sample sizes obtained for each of these analytical units. These analytical units are restricted to the main excavation units or blocks at each of the sites. The sample volume estimates include only matrix which contains cultural material.

I refer to these units as stratigraphically meaningful units of analysis. They represent first approximation attempts to define prehistoric cultural components on the Bliss Islands. Throughout the balance of this volume I attempt to substantiate and interpret these stratigraphic units of analysis in cultural terms.

Notes:

1. I use this term in Wildesen's (1982:53) sense of 'a measurable change in a characteristic or property of an archaeological site, as compared, say, with some prior condition of the characteristic or property.'

2. The radiocarbon dates for the Weir, Camp, and Northeast Point sites are presented, and considered in detail, in Chapter 4.

3. Cultural gravel resembles the gravel which forms in storm beaches at modern high water lines in the Quoddy region. Throughout the known prehistoric period, native people transported substantial quantities of this beach gravel onto their habitation sites to form the basic constituent of living floors, hearths and other cultural features. I use the term cultural gravel to designate gravel sized mineral material which must have been incorporated into the sites through human activity (Black 1983:51). Baird (1881:293) was the first archaeologist to describe gravel living floors in Quoddy region shell middens; however, he interpreted them as natural formations resulting from high water levels in the past.

4. A palimpsest is defined in the Oxford Dictionary as a 'manuscript on which the original writing has been effaced to make room for a second writing'. Binford (e.g. 1981:9) uses this term analogically to describe archaeological deposits resulting from multiple natural and cultural events and processes whose effects are not easily separable. It is in the latter sense that I use it here.

5. In the Partridge Island analysis (Black 1983, in press b) I included shell particles smaller than 3mm diameter in the fine particles category. This methodology results in a systematic underestimation of the prevalence of some shellfish species, especially sea urchins and mussels. In the Weir site analysis, a 10gm subsample was drawn from the fine particles fraction of each column sample; this subsample was sorted and the proportion of each shellfish species and fine organic and mineral particles in it were projected to the fine particles fraction as a whole.

6. Complete site reports of the Weir, Camp and Northeast Point sites are in preparation, and will be published in the New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology series.

****

PART III (tracking with close-ups)

Blank page inserted to maintain continuity.

CHAPTER 4:

CHRONOLOGY, SITE TYPOLOGY, AND LOCATIONAL ANALYSES.

> 'In general, it is possible to determine beforehand the existence of shell heaps by the physical surroundings. Thus, whenever on the sea-coast the shore sloped gently to the south, with fresh water in the neighborhood, shell mounds or beds could always be inferred, especially if in the vicinity of flats where clams could be obtained. Here were generally established the sites of villages or of temporary encampments' (Baird 1881:292).

My aim in this chapter is to demonstrate that the Bliss Islands prehistoric site inventory is representative of the insular Quoddy region prehistoric site inventory as a whole. Further, I attempt to show that interpretations based on the insular Quoddy region sites may be justifiably extended to the mainland sites as well. I have framed my intra-regional comparisons with four variables (radiocarbon dating chronologies, site typologies, site structures, and locational patterns), and have employed both relatively simple and inclusive comparisons between insular and mainland site samples, and more fine-grained comparisons between the subregions described in Chapter 1.

Radiocarbon dating chronologies:

Thirty-seven radiocarbon dates have been processed from archaeological sites in the Quoddy region (see Table B-1). The distribution of dates from sites on the northern shores of Passamaquoddy Bay is shown in Figure 4-1,1 and the distribution of dates from sites in the insular Quoddy region in Figure 4-2. In these figures the dates are represented at two standard deviation ranges.2

A comparison of these diagrams suggests that the radiocarbon chronologies from the mainland and insular subregions are very similar to one another. Furthermore, the radiocarbon chronology for the Bliss Islands spans the entire range of radiocarbon dated occupations in the Quoddy region.

To substantiate these points further, two statistical tests were performed on these data. The radiocarbon dates were grouped as shown in Table 4-1 and chisquare statistics were calculated to test for differences between the mainland and insular date distributions, and between the Bliss Islands and other insular date distributions. The results of these tests are shown in Table 4-2.

In both cases the sample sizes are smaller than desirable; however, the tests indicate there is no significant difference between the radiocarbon date distributions.3 The only obvious difference observable in the raw data is the larger number of dates from the mainland sites which fall in the 1000-350bp age range.

I would argue that the insular Quoddy region radiocarbon chronology is more reliable than that from the northern Passamaquoddy Bay sites for the following reasons. First, all of the insular dates have been processed in the 1980s, and, thus, have smaller standard deviations and are less ambiguous than the mainland dates processed during the 1960s and 1970s. Second, a number of the northern Passamaquoddy Bay dates were measured on marine shell rather than wood charcoal.

The shell dates have not been corrected for the marine reservoir effect because no data exist with which to estimate a correction factor for the Quoddy region. Dating of marine shellfish collected prior to the industrial revolution and atomic bomb testing in other parts of the world (e.g. Mangerud 1972) indicates that organisms drawing part or all of their carbon from the marine reservoir may date from 100-1000 years earlier than contemporaneous wood charcoal depending on local oceanographic conditions. Until more is known about the comparability of shell and charcoal dates in the Maine/Maritimes area, it is best to distrust marine shell as a dating material and to assume that it dates older, by some unknown but significant amount, than contemporaneous charcoal (Black in press b; Black and Whitehead 1988:19; cf. Sanger 1981:39).4

FIGURE 4-1: Distribution of radiocarbon dates on northern Passamaquoddy Bay sites. See Table B-1 for further information about these dates.

****
LIVING CLOSE TO THE LEDGE

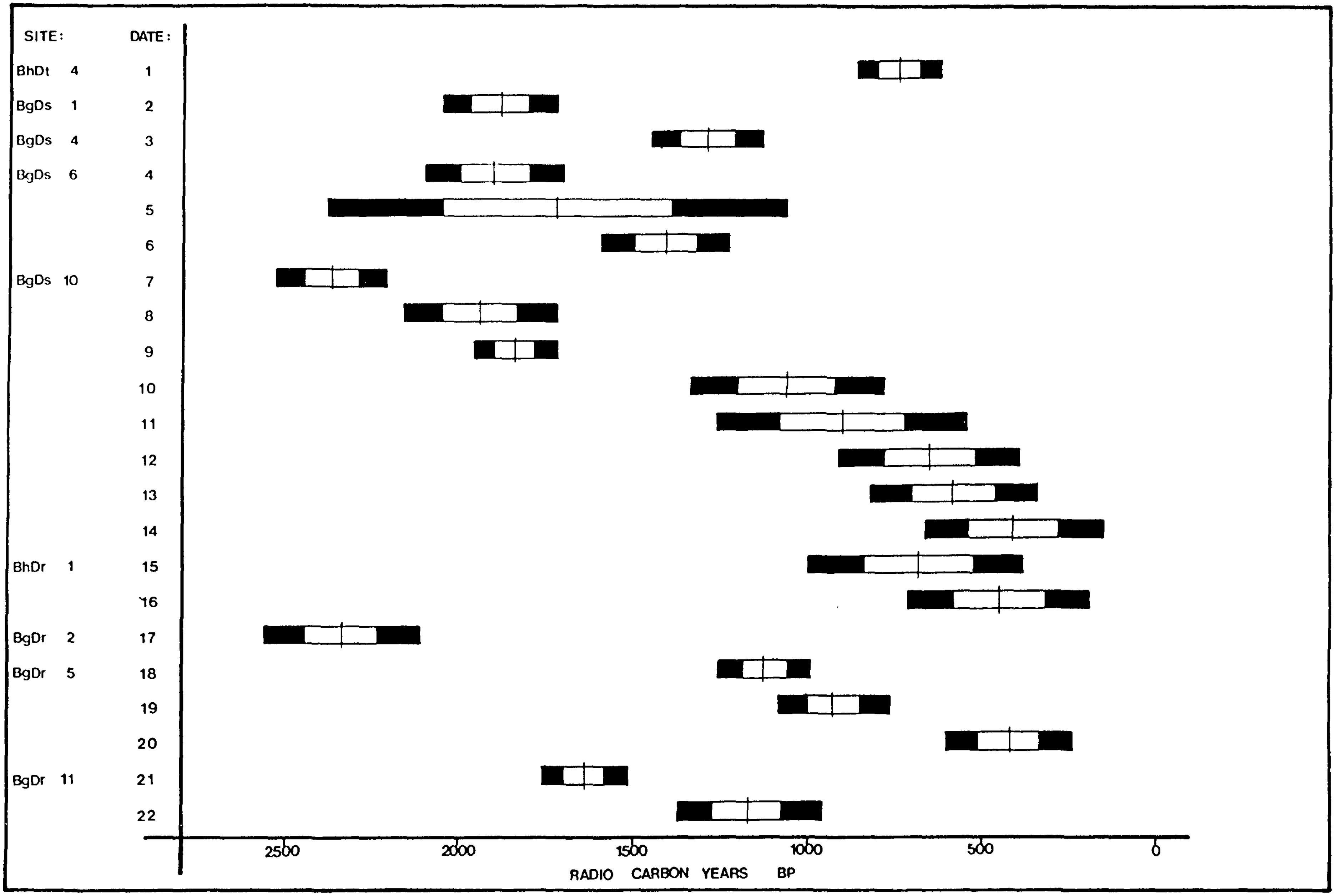

SITE:
DATE:
BhDt 4
BgDs 1
BgDs 4
BgDs 6
BgDs 10
BhDr 1
BgDr 2
BgDr 5
BgDr 11
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
2500
2000
1500
1000
500
0
RADIO CARBON YEARS BP

FIGURE 4-2: Distribution of radiocarbon dates on sites in the insular Quoddy region. Dates on the Bliss Islands sites are shown below the broken horizontal line. See Table B-1 for further information about these dates.

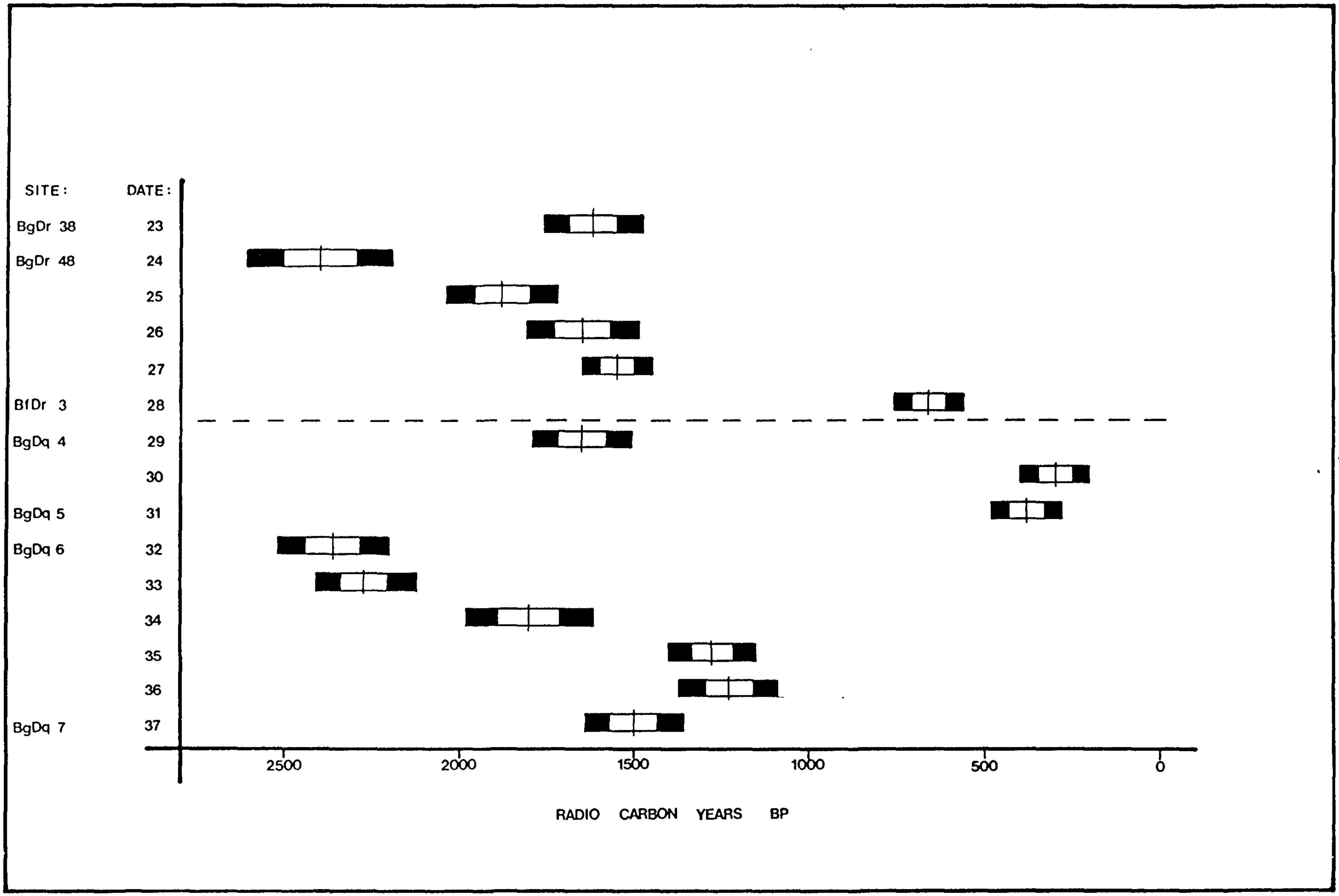

SITE:
DATE:
BgDr 38
23
BgDr 48
24
25
26
27
BfDr 3
28
BgDq 4
29
30
BgDq 5
31
BgDq 6
32
33
34
35
36
BgDq 7
37
2500
2000
1500
1000
500
0
RADIO CARBON YEARS BP

TABLE 4-1: Distributions of radiocarbon dates for chisquare tests.

1)	Age:	>2000 BP	2000-1000	<1000 BP
Location:	mainland	2	11	9
	insular	3	9	3

2)	Age:	>2000 BP	2000-1000	<1000 BP
Location:	Bliss Is.	2	5	2
	other ins.	1	4	1

TABLE 4-2: Summary of chisquare tests on radiocarbon date distributions.

1)

null hypothesis:	There is no significant difference between the mainland and insular radiocarbon date distributions.
degrees of freedom:	2.00
alpha-risk:	0.05
chisquare value:	2.15
critical value:	5.99
results:	null hypothesis retained
comments:	3 cells with expected counts of less than 5

2)

null hypothesis:	There is no significant difference between the Bliss Islands and other insular radiocarbon date distributions.
degrees of freedom:	2.00
alpha-risk:	0.05
chisquare value:	0.19
critical value:	5.99
results:	null hypothesis retained
comments:	5 cells with expected counts of less than 5

Site typologies:

The site typology presented here is a crude measure which sorts the Quoddy region site inventory according to the two types of information most frequently recorded during archaeological surveys in the region: chronological position (historic vs. prehistoric) and site type (shell midden vs. non-shell site). The decision matrix used to sort the sites is shown in Figure B-1. The resulting typology includes eight site categories: 1a) prehistoric shell middens; 1b) multi-component shell middens; 2) historic shell middens; 3) unknown shell middens; 4a) prehistoric non-shell sites; 4b) multi-component non-shell sites; 5) historic non-shell sites; and 6) unknown non-shell sites.5

The distribution of the entire site inventory by site type and subregion is shown in Table B-2. The most prominent problem revealed by these data is the large number of sites that cannot be securely classified to even such rudimentary temporal units as those defined in Figure B-1. There is a much higher proportion of temporally unclassifiable sites (both shell middens and non-shell sites) in the mainland subregions (especially the Passamaquoddy Bay mainland) than in the insular subregions.

This discussion is concerned primarily with the typology of the prehistoric sites (shown in Table 4-3). The first part of Table 4-3 shows insular vs. mainland distributions of site types. The second part compares site type distributions in the northern

TABLE 4-3: Distribution of Quoddy region prehistoric sites by location and site type.

1)	Type:	1a	1b	3	4a	Total:
Location:	mainland	7	6	14	3	30
	insular	10	12	20	5	47
	Total:	17	18	34	8	77

2)	Type:	1a	1b	3	4a	Total:
Location:	BI	1	3	2	1	7
	BBS	3	3	8	1	15
	WIN	5	6	8	0	19
	Total:	8	9	16	1	34

3)	Type:	1a	1b	3	4a	Total:
Location:	WIN	5	6	8	0	19
	WIS	1	0	2	4	7
	Total:	6	6	10	4	26

TABLE 4-4: Summary of chisquare tests on Quoddy region prehistoric site typology.

1)

null hypothesis:	There is no significant difference between the mainland and insular site type distributions.
degrees of freedom:	3.00
alpha-risk:	0.05
chisquare value:	0.35
critical value:	7.81
results:	null hypothesis retained
comments:	2 cells with expected counts of less than 5

2)

null hypothesis:	There is no significant difference between site type distributions in WIN and WIS.
degrees of freedom:	3.00
alpha-risk:	0.05
chisquare value:	13.63
critical value:	7.81
results:	null hypothesis rejected
comments:	7 cells with expected counts of less than 5

West Isles and Back Bay shelf subregions (the Bliss Islands data shown here for comparison are redundant with the Back Bay shelf data). The third part of Table 4-3 compares site type distributions in the northern and southern West Isles subregions.

For the purposes of this discussion I have included unknown shell middens (category 3) with the prehistoric sites. My rationale for this inclusion is that, given my experience with the Lighthouse Cove and Pintlowes Cove sites (Black 1988d, 1988e), many of the unknown shell middens may include prehistoric components.6 (In contrast, I suspect that most of the unknown non-shell sites [category 6] are historic sites, about which no information beyond site location was recorded and from which no artifacts were collected).

Chisquare tests were performed on the data shown in Table 4-3 in an attempt to detect intra-regional differences in prehistoric site type distributions. The sample sizes are smaller than desirable, and make the test between the northern West Isles and Back Bay shelf data invalid (Table 4-4). However, the first test indicates there is no significant difference between the prehistoric site type distributions of the mainland and insular regions. Qualitatively, there are no striking differences between the northern West Isles and Back Bay shelf site type distributions except for the presence of one non-shell prehistoric site in the latter subregion. The third test shown in Table 4-4 indicates there is a significant difference between the site type distributions of the two West Isles subregions. There is a much higher density of prehistoric sites in the northern West Isles, all of which are shell middens, whereas the much lower density of sites in the southern West Isles consists predominantly of non-shell prehistoric sites.

Site structures:

Some aspects of site structure have been considered in the site typology presented above. The purpose of this descriptive section is to consider site structures in more detail, and to show that the structures and contents of the Bliss Islands sites are similar to those of other sites in the Quoddy region.

The Weir site is similar in structure to the Partridge Island site, the only other large deep shell midden excavated in the insular Quoddy region (Black in press b). In general, large deep shell middens are characterized by areas greater than 100m2 and depths of 40-150cm. Both the Partridge Island and Weir sites are composed of alternating sets of living-floor and shell midden deposits sandwiched between natural soil layers. Both sites contain strikingly similar sets of stratigraphic components.

There may be other similar deep shell middens in the insular Quoddy region, most notably BgDr44 on Pendleton Island, BgDr47 on Parker Island, and BgDr39 on Deer Island (Davis 1982b), none of which have been tested. Large deep midden sites on the

Passamaquoddy Bay mainland have been reported as unstratified or without distinct or interpretable stratification (e.g. Davis 1978:10; McCormick 1980:160). However, Bishop and I (Bishop 1983a; Bishop and Black 1988) have noted that existing information (radiocarbon dates, field notes, profile descriptions, and photographs) suggests that some of these sites (especially Sandy Point and Minister's Island) may contain stratification and structural components similar to those in the Weir and Partridge Island sites. Hale (1985) reports that deep stratified deposits still exist at the Simpson's Farm site, as Baird (1881) reported more than a century ago.

Large shallow shell middens, such as the Camp site, are apparently more common and more typical of Quoddy region shell middens in general, than is the Weir site. These sites are characterized by areas greater than 100m2 and depths of 40cm or less. They contain less readily defined stratification, and less distinct floor and midden features than large deep middens, and are usually incorporated into developing soil profiles rather than between distinct soil layers. All have been subject to natural pedogenic disturbances to a significant extent.

The only other shallow shell midden of this size which has been tested in the insular Quoddy region is the Pendleton Passage site (Black 1984b). The Gooseberry Point site (Black and Johnston 1986; Rojo 1987; Turnbull 1981) also resembles the Camp site, although on a much smaller scale. It is probable that many of the untested large middens in the region, such as BgDr35 and BgDr37 on Deer Island (Davis 1982b), and BgDq14 on Parks Island (Davis and Ferguson 1981) are similar. On the Passamaquoddy Bay mainland, the Carson site (Sanger 1987) is similar in many respects to the Camp site; it is shallow, indistinctly stratified, has a relatively low shell content, and contains both floors and midden deposits.

The small shallow shell middens, such as the Lighthouse Cove and Pintlowes Cove sites on the Bliss Islands, are similar in many respects to the large shallow shell middens, except they are less extensive and less frequently contain distinct living floor deposits. Small shell middens may be the most common prehistoric site type in the Quoddy region. Examples of insular sites similar to the Lighthouse and Pintlowes Cove sites include the Little Midden (BgDr49) on Partridge Island (Bishop 1983a:15; Black 1983:49-50), BgDq9 and BgDq10 on Hills Island (Davis and Ferguson 1981), and the Baird (BdDq3) and Cheney Island (BdDq4) sites on Grand Manan (Black 1984a:21-24). There are probably similar sites on the Passamaquoddy Bay mainland, but these have not been tested.

The Ledge site, a small, shallow, but distinctly stratified midden, is unique in the Quoddy region site inventory, and, thus, somewhat enigmatic. However, it may exemplify the structural details of shallow shell middens when they are preserved under optimal conditions (Black 1988c).

****

There are few non-shell prehistoric sites recorded in the Quoddy region, and the Northeast Point site on the Bliss Islands is apparently the only one from which an *in situ* artifact assemblage has been recovered. The data from the Northeast Point site are of high quality because the prehistoric deposits are sealed beneath a peat layer, and there has been no historic disturbance of the site. It is particularly noteworthy that distinct floor features are present in this site. There is no indication in the literature that features have previously been recognised in non-shell prehistoric sites in the Quoddy region.

The data from the prehistoric sites in the insular part of the region are more complete, in that they have been gathered from a wider variety of site types, than is the case for the Passamaquoddy Bay mainland subregion, where research has focussed on large shell middens to the virtual exclusion of other site types. The insular sites also generally appear to be better preserved than the mainland sites; while all of the Bliss Islands sites have been affected by erosion and by natural pedogenic processes, three (Weir, Ledge and Northeast Point) have not been disturbed by historic activity at all, and retain considerable stratigraphic integrity.

Locational patterns:

In 1983 Chris Turnbull and Linda Jefferson began to gather information for a locational analysis of Quoddy region shell middens. During 1983 and 1984 I extended this analysis and reported some preliminary results (Black 1984d). Our interest in locational analysis was to some extent inspired by Kellogg's (1982) locational analysis of prehistoric shell middens in the Boothbay region of Maine, although the methods we have used are different than Kellogg's.7 Sanger (1987:59-61) has also recently reported some locational information relevant to the sites on northern Passamaquoddy Bay.

It is not my intention to present a complete locational analysis of the Quoddy region sites here. Rather, I present locational information to substantiate my contention that mainland and insular site locations are similar. The usual explanation for site locations has been that native people placed their habitation sites to maximize shelter from prevailing winter winds and exposure to the sun during cold weather (e.g. Sanger 1971:18; 1987:59); this explanation ties site location to site seasonality. The locational data presented here are used to address this interpretation.

To this end, annual and seasonal wind speed and direction patterns for St. John, located just outside the eastern end of the Quoddy region, are presented in a series of graphs in Appendix B. Figure B-2 shows the data for the whole year, and Figures B-3, B-4, B-5, and B-6 show the seasonal patterns for spring, summer, autumn and winter, respectively. These patterns can be summarized as follows: (i) the prevailing winds in winter are from the northwest and in summer from the southwest; (ii) spring and autumn are intermediate to the other seasons, characterized by both northwest and southwest winds; (iii) northwest and southwest winds are generally the highest velocity winds in the region; (iv) southeast winds are uncommon, occurring mainly in the warm seasons, and are of moderate velocity; (v) northeast winds are rare, occurring mainly in winter, and are of low velocity.

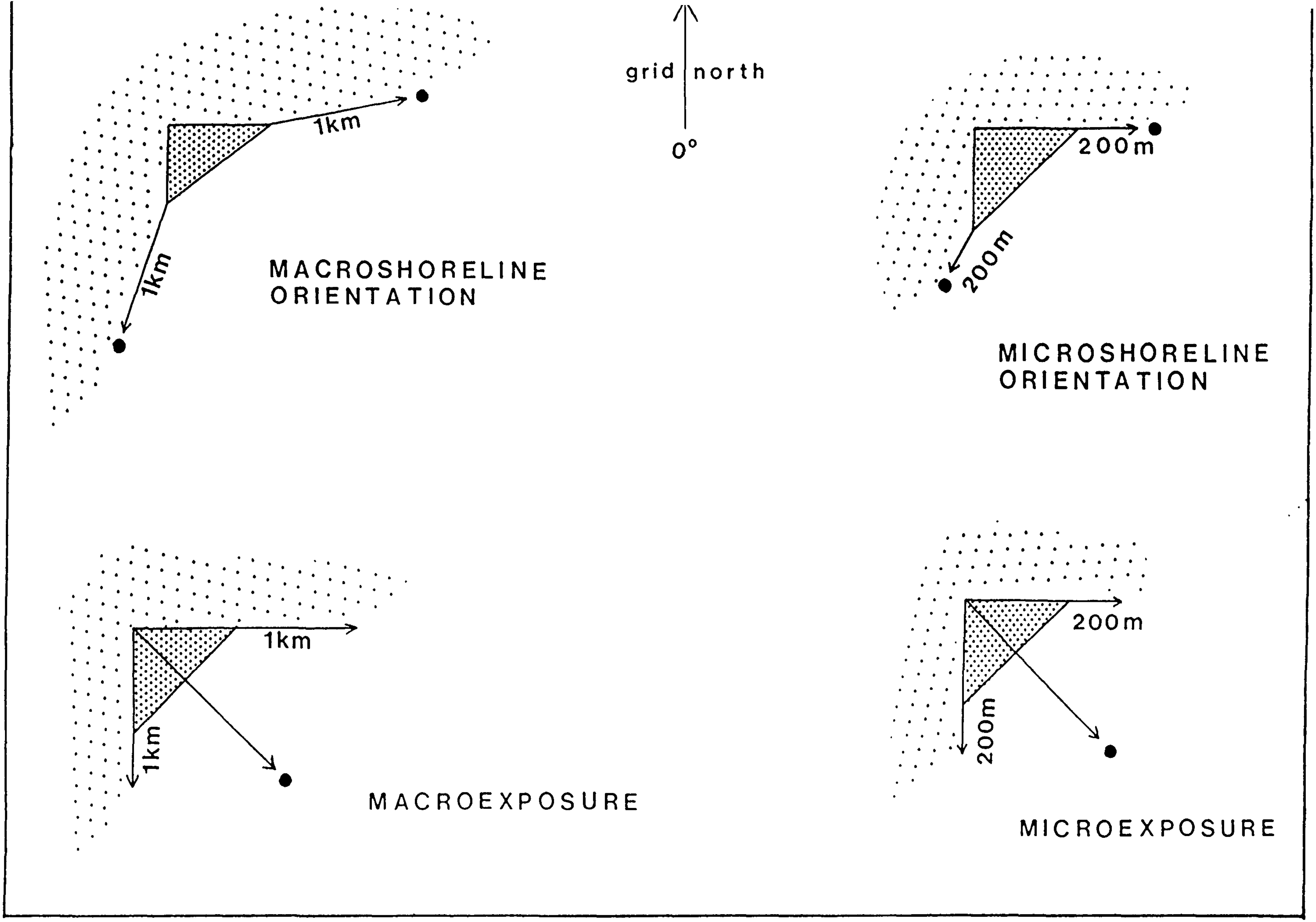
Sites and Random Points

To facilitate locational analyses, the shorelines of the Canadian Quoddy region have been divided into arbitrary 0.5km length segments. These segments are numbered sequentially within each of the subregions defined in Chapter 1. Samples of these segments were selected randomly (and are referred to below as random points) for comparison to the archaeological sites. Table B-4 shows the sample sizes of archaeological sites and random points compared in this study.

Variables

Four variables were measured for each archaeological site and random point. These variables are: (i) macroshoreline orientation; (ii) macroexposure; (iii) microshoreline orientation; and (iv) microexposure. Macroshoreline orientation is defined as two bearings describing the main trend of the shoreline for 1km in

FIGURE 4-3: Schematic diagram of variables used to derive Quoddy region site location data. Densely stippled triangles represent sites; coarsely stippled areas represent the landward sides of sites; blank areas represent the seaward sides of sites; arrows to points indicate the bearing(s) measured for the variable.


grid north
0°
1km
1km
MACROSHORELINE ORIENTATION
200m
200m
MICROSHORELINE ORIENTATION
1km
1km
MACROEXPOSURE
200m
200m
MICROEXPOSURE

each direction from the site or random point; macroexposure is the bearing bisecting the angle formed by the macroshoreline orientation bearings in the direction of the water. Microshoreline orientation is defined as two bearings describing the trend of the shoreline in the immediate vicinity of the site or random point (ca. 200m in each direction); microexposure is the bearing bisecting the angle formed by the microshoreline orientation bearings in the direction of the water.[8] The four variables are represented diagrammatically in Figure 4-3. The bearings were measured on 1:50,000 scale topographic maps with north at 0° and with the axes of the compass parallel to the transverse mercator grid. The data for each variable have been grouped by compass quadrants for graphic presentation and statistical tests. The quadrants used are: (i) northeast (1°-90°); (ii) southeast (91°-180°); (iii) southwest (181°-270°); and (iv) northwest (271°-360°).

Location and exposure of the Bliss Islands sites

The locations of the archaeological sites and random points on the Bliss Islands compared in this discussion are shown in Figure 4-4. Each of these random points represents a 50m shoreline segment. Data pertaining to the locations and exposures of these sites and random points are shown in the graphs in Figure 4-5. The random points chosen for comparison represent 20% of the shoreline segments designated on the islands. Prehistoric shell middens include the Weir, Camp, Lighthouse Cove, and Pintlowes Cove sites. The possible prehistoric shell midden is the Ledge site. The unknown shell midden is the White Water site. The non-shell site is the Northeast Point site.

The random points on the Bliss Islands are situated on macroshoreline segments and microshoreline segments oriented in all four quadrants; however, southwest oriented shoreline segments are the most common locations and southeast oriented segments least common. The random points also have macroexposures and microexposures oriented in all four quadrants; in the cases of both variables, the most common orientations are northwest and southeast.

The prehistoric shell middens are located on southeast or southwest oriented macroshoreline segments and on northeast and southwest oriented microshoreline segments; none are located on northwest orientated shoreline segments. The prehistoric shell middens are exposed to the southeast or southwest (usually the southeast) with respect to both macroexposure and microexposure. The Ledge site is located similarly to the definitely prehistoric shell middens, except that it is more exposed to the northeast.

The macroshoreline segment on which the White Water site is located is oriented northwest-northeast, and its macroexposure is to the northwest, a very different pattern from the other shell

FIGURE 4-4: Locations of archaeological sites and random points compared for the Bliss Islands locational analysis.

****

LIVING CLOSE TO THE LEDGE

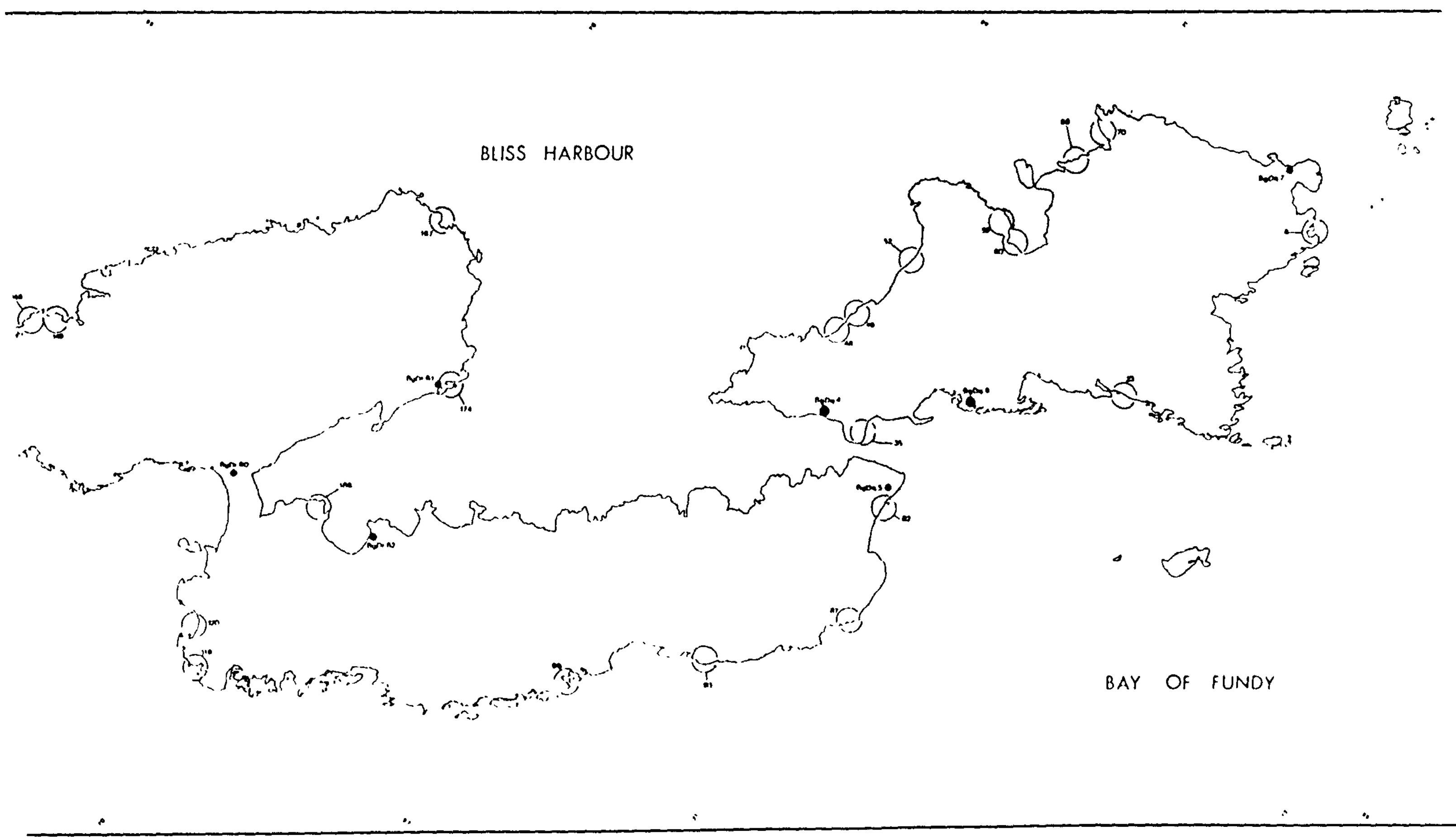
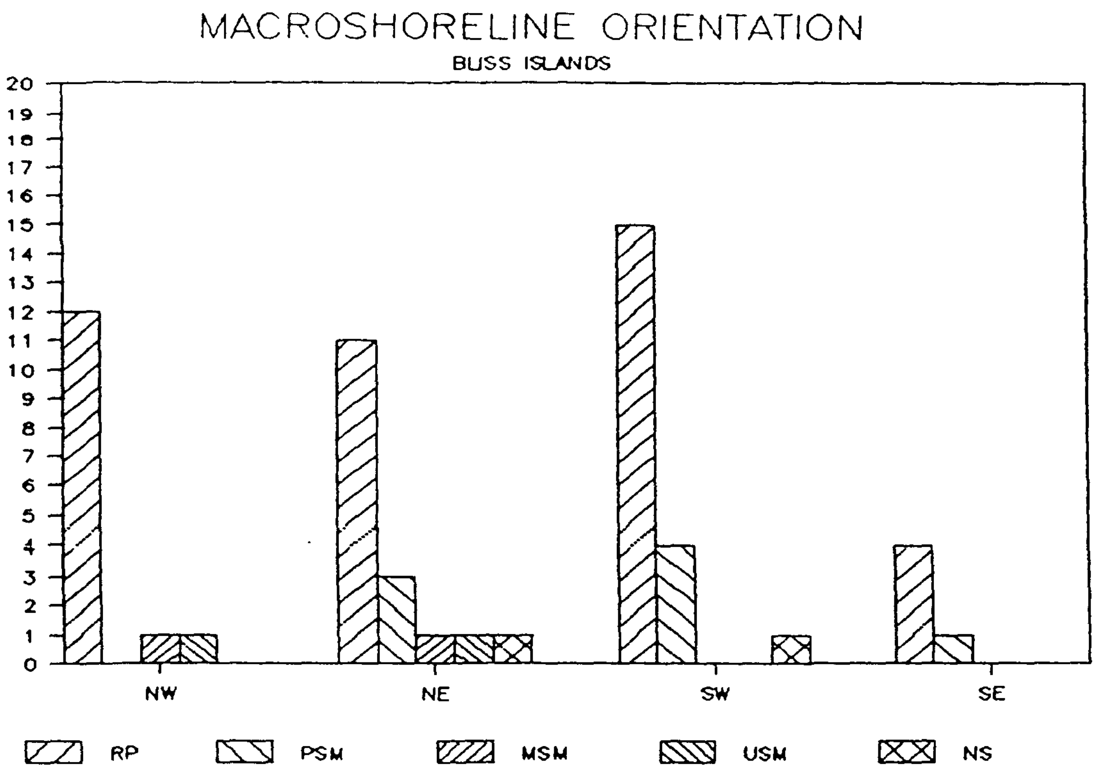
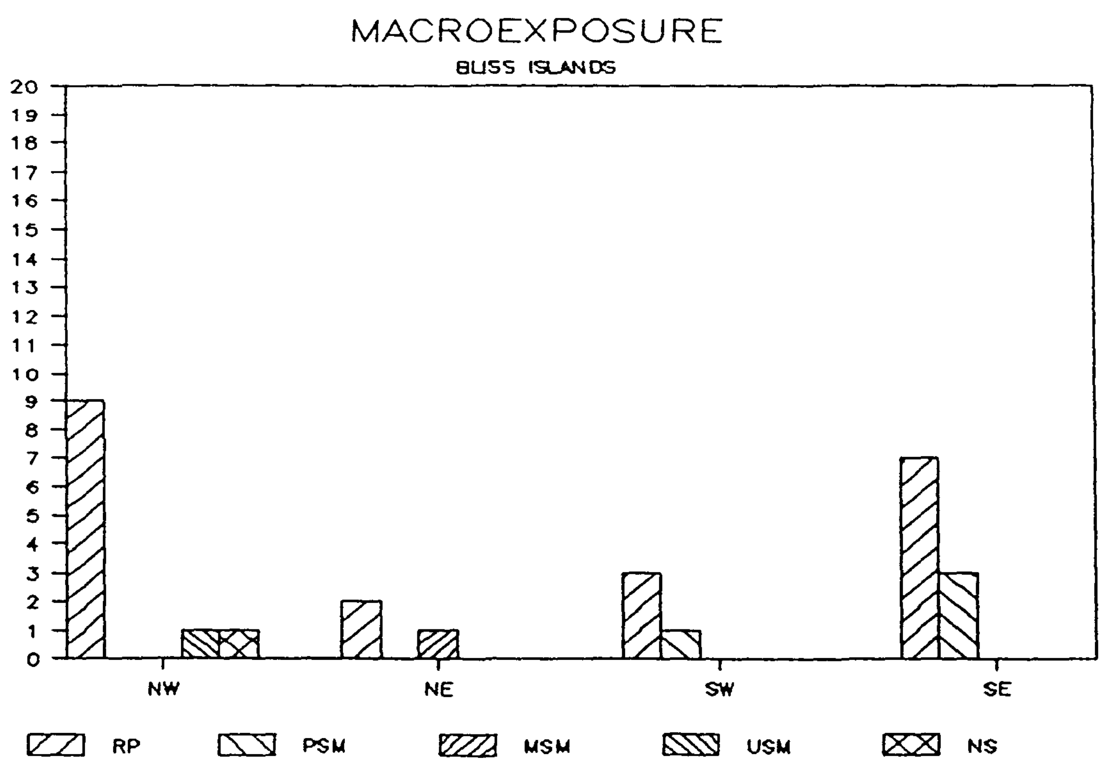

BLISS HARBOUR
BAY OF FUNDY

FIGURE 4-5: Comparison of locational data for random points, non-shell sites, and shell middens on the Bliss Islands. RP = random points; PSM = prehistoric shell middens; MSM = possibly prehistoric shell middens; USM = unknown shell middens; and NS = non-shell prehistoric sites.

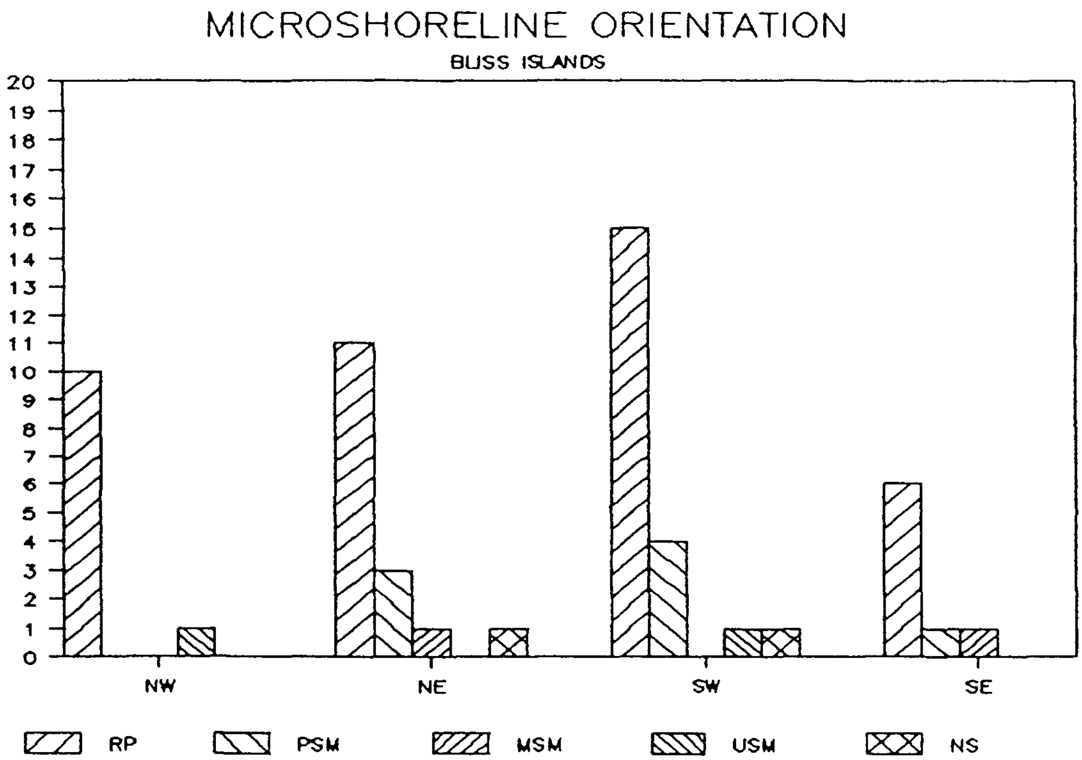
****
LIVING CLOSE TO THE LEDGE

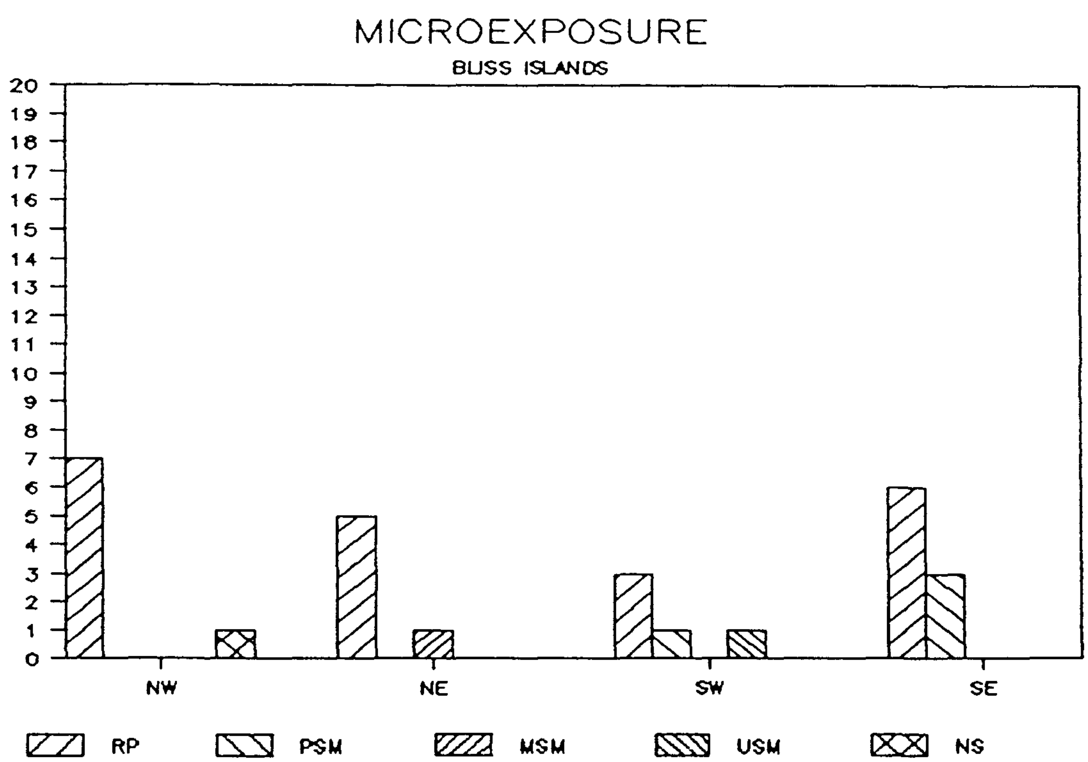


MACROSHORELINE ORIENTATION
BLISS ISLANDS
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
NW
NE
SW
SE
RP
PSM
MSM
USM
NS



MACROEXPOSURE
BLISS ISLANDS
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
NW
NE
SW
SE
RP
PSM
MSM
USM
NS





****

LIVING CLOSE TO THE LEDGE

middens. However, the microexposure of the site is to the southwest, similar to the other shell middens.

The Northeast Point site is located on a northeast-southwest oriented shoreline segment, and is exposed directly to the northwest. Thus, the location and exposure of this site are very different from those of the shell middens.

These observations concerning Bliss Islands locational patterns can be summed up in the following series of points: (i) shoreline segments on the Bliss Islands are oriented in all directions, but northwest and southwest orientations, and northwest and southeast exposures are most common; (ii) shell middens are not randomly located--they strongly tend to be located on southwest and southeast oriented shoreline segments, and to be exposed to the southeast; (iii) the less certainty about the chronological position of a shell midden, the less its location and exposure correspond to the pattern noted above; and (iv) the non-shell site is exposed directly to the northwest, the opposite of the central tendency for shell midden exposures.

Statistical tests

The number of sites on the Bliss Islands is not large enough to allow valid chisquare tests to be performed on the locational data. The number of random points considered could be increased, but the number of sites cannot. As a result, in this section I compare locational data from the northern Passamaquoddy Bay, northern West Isles and Back Bay shelf subregions statistically, to substantiate the points made descriptively above and to further explore prehistoric site locations in the Quoddy region.

Location and exposure of Quoddy region sites

The locational data for the Quoddy region sites is shown in a series of graphs in Appendix B. Figures B-7, B-8, and B-9 show the data for random points and prehistoric sites in the Passamaquoddy Bay mainland, Back Bay shelf, and northern West Isles subregions respectively. Figure B-10 shows the data for all of the prehistoric sites in the Quoddy region. Chisquare tests performed on these data are summarized in Table 4-5.

There are differences in geomorphology in the Quoddy region that result in significant differences in the orientations and exposures of shorelines between the St. Croix estuary /Passamaquoddy Bay parts of the region and the West Isles/Bay of Fundy parts of the region (Table 4-5, 1, 2, 3 &4). However, these geomorphological differences are not obviously reflected in the locations of archaeological sites. In spite of the orientations of the shoreline segments on which they are located at a macro scale, shell middens throughout the Quoddy region tend to be located on east-west oriented microshoreline segments, exposed to the southeast, the southwest, or both, and sheltered to the

TABLE 4-5: Summary of chisquare tests on Quoddy region locational data.

1)

null hypothesis: There is no significant difference between distributions of macroshoreline orientations of random points in different subregions.
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 20.77
critical value: 12.60
results: null hypothesis rejected
comments:

2)

null hypothesis: There is no significant difference between distributions of macroexposures of random points in different subregions.
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 18.31
critical value: 12.60
results: null hypothesis rejected
comments: 5 cells with expected counts of less than 5

3)

null hypothesis: There is no significant difference between distributions of microshoreline orientations of random points in different subregions.
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 24.63
critical value: 12.60
results: null hypothesis rejected
comments:

4)

null hypothesis: There is no significant difference between distributions of microexposures of random points in different subregions.
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 14.43
critical value: 12.60
results: null hypothesis rejected
comments: 6 cells with expected counts of less than 5

5)

null hypothesis: There is no significant difference between distributions of macroshoreline orientations of shell middens in different subregions.
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 14.70
critical value: 12.60

results: null hypothesis rejected
comments: 7 cells with expected counts of less than 5

6)
null hypothesis: There is no significant difference between distributions of macroexposures of shell middens in different subregions.
degrees of freedom: 2.00
alpha-risk: 0.05
chisquare value: 10.73
critical value: 5.99
results: null hypothesis rejected
comments: 4 cells with expected counts of less than 5

7)
null hypothesis: There is no significant difference between distributions of microshoreline orientations of shell middens in different subregions.
degrees of freedom: 2.00
alpha-risk: 0.05
chisquare value: 5.52
critical value: 12.60
results: null hypothesis retained
comments: 8 cells with expected counts of less than 5

7)
null hypothesis: There is no significant difference between distributions of microshoreline orientations of shell middens in different subregions.
degrees of freedom: 2.00
alpha-risk: 0.05
chisquare value: 5.52
critical value: 12.60
results: null hypothesis retained
comments: 8 cells with expected counts of less than 5

8)
null hypothesis: There is no significant difference between distributions of microexposures of shell middens in different subregions.
degrees of freedom: 2.00
alpha-risk: 0.05
chisquare value: 6.69
critical value: 5.99
results: null hypothesis rejected
comments: 3 cells with expected counts of less than 5

9)
null hypothesis: There is no significant difference between distributions of macroshoreline orientations of insular and mainland archaeological sites
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 10.16
critical value: 12.60
results: null hypothesis retained

comments: 4 cells with expected counts of less than 5

10)
null hypothesis: There is no significant difference between distributions of microshoreline orientations of insular and mainland archaeological sites
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 2.98
critical value: 12.60
results: null hypothesis retained
comments: 4 cells with expected counts of less than 5

11)
null hypothesis: There is no significant difference between the distributions of shoreline segments on which random points and archaeological sites are located.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 28.23
critical value: 7.81
results: null hypothesis rejected
comments:

12)
null hypothesis: There is no significant difference between the distributions of shoreline segments on which random points and archaeological sites on the QR mainland are located.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 15.44
critical value: 7.81
results: null hypothesis rejected
comments: 4 cells with expected counts of less than 5

13)
null hypothesis: There is no significant difference between the distributions of shoreline segments on which random points and archaeological sites in the insular QR are located.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 20.94
critical value: 7.81
results: null hypothesis rejected
comments: 2 cells with expected counts of less than 5

northwest (Table 4-5, 7 &10). There are some significant differences between samples of shell middens from different subregions (Table 4-5, 5 &6), but these differences are not significant when the variability within the entire sample of sites is considered (Table 4-5, 9).

There is evidence for a significant difference between the microexposures of insular and mainland shell middens (Table 4-5, 8); insular middens are more frequently exposed to the southeast, while mainland middens are more frequently exposed to the southwest (Figure B-10). This contrast simply reflects differences in regional geomorphology. Non-shell sites do not generally conform to the same locational patterns as shell middens. They are exposed to the north more frequently than to the south (Figure B-10), and some are exposed directly to the northwest.

Other aspects of location

In Table B-5 the random points and archaeological sites are classified according to the type of shoreline segment on which each is located. Four types of shoreline segments are recognised: (i) points/headlands; (ii) open shores; (iii) channels; and (iv) coves. These data indicate that the archaeological sites are preferentially located on sheltered shoreline segments, especially along channels and in small coves. Chisquare tests (Table 4-5, 11

& 12) indicate that the differences between the sites and the random points are statistically significant. Unfortunately, the sample sizes are too small to determine statistically whether mainland and insular archaeological sites differ in this respect. However, the distributions are similar to one another; sheltered shoreline segments appear to have been the preferred locations for both mainland and insular sites.

Kellogg (1982) interprets a similar locational pattern in the Boothbay region as indicating that prehistoric people located sites at places where their boats could be easily landed. Sanger (1987:56) notes that small coves adjacent to archaeological sites often contain soft substrates which would facilitate landing and launching boats. Certainly, all of the Bliss Islands sites, whether located in coves or channels, are adjacent to areas of soft substrate.

Kellogg (1987) found that prehistoric shell middens in Boothbay are significantly closer to soft-shelled clam beds than the random points to which he compared the sites. This variable has not been considered quantitatively in the present study, but Quoddy region shell middens are usually located close to high productivity intertidal zones (Black 1983:164, 1985a:21), whether these are soft-shelled clam beds (as at the Camp, Lighthouse Cove and Pintlowes Cove sites) or rocky intertidal ledges (as at the Ledge and Weir sites). As Sanger (1971:18) points out, this factor is confused by the alteration of intertidal substrates caused by sea level rise since the sites were occupied. Yesner (1980) points out that clam beds on the Northeast coast are usually located on southeast and southwest exposed shorelines because of regional geomorphology. This factor probably partly accounts for the observed differences in exposure between shell midden and non-shell midden sites.

Kellogg (1987) found that access to a fresh water source was apparently not an important determinant of site location for the Boothbay shell middens he studied. Similarly, none of the Bliss Islands shell middens are close to a substantial fresh water source, although the Northeast Point site is. Again, this phenomenon may be complicated by changes in freshwater sources caused by rising sea levels. For example, the salt marsh adjacent to the Weir site may have been a fresh water marsh during much of the occupation of that site.

Finally, Kellogg (1982; Kellogg and Sanger 1984) found that shell middens in the Boothbay region are usually located in areas of medium erosion, while random points are usually located in areas of low erosion. He concluded that although some middens have been eroded away in Boothbay, the present inventory of shell middens is representative of the total distribution of 'Ceramic Period' middens in the region. This conclusion cannot be extended to the Quoddy region, with its much greater tidal range and rate of coastal submergence. I suspect that a significant number of shell middens and other coastal archaeological sites, dating throughout the Woodland period, have been completely eroded in the Quoddy region. The loss of these sites will continue to skew our interpretations of prehistoric settlement in the region.

Conclusions and Interpretations

Typically, a Quoddy region shell midden is located on a sheltered east-west oriented shoreline segment, exposed to the southeast and/or southwest, and sheltered to the northwest. It is close to a high productivity intertidal zone, and to a place where small boats can be landed conveniently. It may be some distance from a significant fresh water source, but is usually adjacent to a marsh. It is usually situated on a low, sloping area of glacial subsoil, and is immediately adjacent to the high water line.

The more of these attributes a particular place exhibits, the more likely it is to contain a large shell midden, representing either short term intensive occupation, long term occupation, or sequential re-occupation over several centuries, or a combination of these settlement patterns. Access to intertidal resources, and ease of boating, appear to be the most important concerns expressed by Quoddy region shell midden locations. Smaller prehistoric shell middens may represent special purpose sites or 'experimental' occupations of places not subsequently re-occupied because they proved to be non-optimal locations for habitation sites.

Non-shell midden sites may differ from shell middens in terms of season of occupation, duration of occupation, and function, since some of them appear to have been located according to a different set of criteria than shell middens. The Northeast Point site, for example, is not located near a high productivity intertidal zone, but is located next to a significant fresh water source. It is not sheltered to the northwest, but is adjacent to a sheltered cove where boats could have been easily landed. A typical pattern of location for non-shell sites cannot be drawn from the small amount of data available.

I suggest that locational attributes are poor indicators of seasonality in the Quoddy region. They have often been used to substantiate interpretations based on faunal analyses.[9] The model of shell midden location and the data on wind speed and direction presented here can be used to substantiate almost any seasonality model one cares to generate.

Shelter to the northwest and exposure to the south do suggest a concern with ameliorating the effects of winter weather. However, most of the sites are also exposed to prevailing summer winds, a desirable exposure for warm season occupation, since summer breezes keep biting insects down, and prevent the buildup of the stifling humidity characteristic of forest clearings in the summer. Exposure to the sun, in a damp, generally overcast coastal climate is equally desirable in summer and winter.

****
LIVING CLOSE TO THE LEDGE

The Bliss Islands as a microcosm of the Quoddy region:

In summary, the information presented in this chapter suggests that the Bliss Islands prehistoric site inventory is representative of the insular Quoddy region prehistoric site inventory in terms of the four variables considered. The Bliss Islands sites are most representative of the Back Bay shelf and northern West Isles subregions, where the majority of the insular Quoddy region prehistoric sites are located and where most previous archaeological research has been conducted. It is more difficult to demonstrate that the Bliss Islands sites are representative of the sites in the southern West Isles and Grand Manan subregions because of the differences in the site inventories of, and the smaller amount of research conducted in, the southern subregions. However, what is known of the southern sites indicates that they do not differ markedly from comparable sites in the northern subregions.

At least 10 sites have been extensively excavated in the Passamaquoddy Bay mainland part of the Quoddy region over a period of more than a century. In contrast, all archaeological excavations in the insular Quoddy region have been conducted since 1980; only 3 insular sites have been extensively excavated and 7 others tested, and none of the sample sizes from the insular sites are as large as those from the mainland sites. Nevertheless, I maintain that my interpretations of insular Quoddy region prehistory and human ecology, based on the Bliss Islands sites, are largely applicable to the entire region. My reasons for making this claim are as follows: (i) the radiocarbon chronology from the Bliss Islands covers the entire range of dated prehistoric occupations in the region as a whole; (ii) the Bliss Islands prehistoric site inventory contains examples of all of the site types previously recorded in the region; (iii) the Bliss Islands sites contain a range of contents and structures that parallels those found in other sites excavated throughout the region; and (iv) the locational patterns of the Bliss Islands sites are similar to those of other prehistoric sites in the region.

In addition, as I have pointed out throughout this chapter, in several respects the data from the insular sites are more reliable than those reported from the northern Passamaquoddy Bay sites: (i) the insular radiocarbon dates are more precise; (ii) the stratigraphic control of the insular data is better; (iii) the preservation of the insular sites is better; and (iv) a wider range of site types has been tested in the insular Quoddy region. However, there is evidence of differences in the prehistoric human ecology of the insular and mainland parts of the Quoddy region. For example, insular subsistence practices indicate a greater emphasis on capturing marine fish and marine mammals, and on gathering from rocky intertidal substrates. There are no a priori reasons to deny the possibility of minor differences between the prehistoric cultural history records of the mainland and insular parts of the region as well.

Notes:

1. All of these dates are from mainland sites except the series of dates from the Minister's Island site (BgDs10). Minister's Island is attached to the mainland by a gravel bar which is covered by ca. 50cm of water at high tide. The inundation of this bar is apparently a recent event, and prehistoric sites on this island may effectively have been mainland sites during much of their occupation. In this dissertation the Minister's Island site is grouped with the Passamaquoddy Bay mainland sites, except in the discussion of site typologies in this chapter.

2. The radiocarbon dates discussed in this dissertation are reported as received from the radiocarbon lab(s); the standard deviations quoted reflect only the probablistic nature of radioactive decay. I have reported them this way to facilitate comparisons with published material, since this is how archaeological radiocarbon dates are usually reported on the Northeast coast. Ideally, radiocarbon dates should be converted from radiocarbon years (bp) to calendrical years (BP) by correcting for secular changes in atmospheric carbon isotope ratios (using graphs such as those published by Stuiver and Pearson 1986). In a very general way, the following differences are indicated: i) dates from 100-600bp are 100-200 years older than reported; ii) dates from 600-1000bp are 100-200 years more recent; iii) dates from 2100-2400bp are the same or slightly older; and iv) dates earlier than 2500bp are 200 or more years older than reported.

3. These and subsequent chisquare tests were performed using the computer statistical package 'Minitab'. Minitab reports the number of cells in which the expected counts are less than 5. Most statisticians (e.g. Ryan et al. 1985:274) consider that no more than 20% of the cells should have less than 5 expected counts for the chisquare approximation to be reliable. Where I have reported tests in which this rule is

violated, I have indicated that the sample sizes are small. Minitab issues a 'warning' if any cells have expected counts of less than 1, and informs the user that the chisquare approximation is probably invalid. I have either not reported such tests in the dissertation or indicated that such tests are 'not valid'.

4. I have to confess that I am responsible for the only radiocarbon date on marine shell from an insular site, the Pendleton Passage site on Deer Island (Black 1984b). It was my experience with interpreting this date that led to my interest in the potential problems of dating marine shell.

5. Two methodological points should be noted about this classification. First, the criteria for inclusion have been very rigidly applied; prehistoric and historic components are ascribed only in cases where <u>artifactual</u> evidence of these affiliations is definitely present. Second, the term multi-component is used in a restricted sense in this classification to distinguish sites which have yielded both historic and prehistoric artifacts. (The survey data are not complete enough to allow particular prehistoric and historic components to be distinguished in a sufficient number of cases to warrant this practice.) In other parts of the dissertation I have used more liberal criteria in designating prehistoric sites, and used the term multi-component in a more conventional manner.

6. This interpretation contrasts with my previous conclusions (Black 1983:164-65, 1985a:57), where I suggested that many of the small shell middens in the Quoddy region might be completely historic.

7. Kellogg selected random points in Boothbay, and visited both these and archaeological sites to gather locational data for his study. Thus far, my locational study of Quoddy region sites is based on data taken from topographic maps and site maps; random points have not been studied in the field.

8. The 'microexposure' variable defined in this study most closely approximates Kellogg's (1987:148) variable 'aspect'.

9. Binford (e.g. 1981:83) refers to this sort of reasoning as post hoc accommodative arguments. I hasten to point out that I am as guilty of these uses of locational data as any other researcher in the Quoddy region.

****

LIVING CLOSE TO THE LEDGE

CHAPTER 5:

CULTURAL HISTORY OF THE BLISS ISLANDS.

> "At one end of the dichotomy--I shall call it time's arrow--history is an irreversible sequence of unrepeatable events. Each moment occupies its own distinct position in a temporal series..." (S.J. Gould in Time's Arrow, Time's Cycle).

In this chapter I describe the artifact assemblages from the Bliss Islands analytical units and compare them to one another. The Weir site stratigraphic components are considered first; the other assemblages are then related to those from Weir. The sample sizes are not large enough to allow tests of statistical significance to be used to compare the artifact assemblages. As a result, I rely on descriptive statistics and illustrations.

My purpose in this chapter is to develop a temporal sequence for the analytical units based, as much as possible, on local stratified evidence, and to examine the cultural relationships of the prehistoric sites on the Bliss Islands. Throughout the text of the chapter, I have substantiated my culture history interpretations by comparing artifacts from the Bliss Islands sites to similar artifacts from other sites in the Quoddy region and in the Maine/Maritimes area. However, these comparisons are not exhaustive.

Presentation of data:

Numerical data are presented in a series of tables in Appendix C. Table C-1 shows the distributions of unifacial tools, cores and debitage; Table C-2 shows the distributions of bifacial tools, ground stone tools, and other altered lithics. Table C-3 shows the distribution of ceramics by weight, the proportions of shell and grit tempered ceramics in each assemblage, and the distribution of ceramic decorative motifs. Table C-4 shows the distributions of organic artifacts.

Descriptions of the 15 types of lithic materials identified in the Bliss Islands assemblages are summarized in Table C-5. The lithics include crystalline quartz, quartzite, volcanic extrusives, mudstone, a variety of cryptocrystalline quartzes,1 metasediments, slate, and crystalline plutonics and metamorphics. Each lithic type is classified as local or exotic in origin.2 The descriptions follow those of Crotts (1984).

The final 5 tables in Appendix C present distributions of the lithic material types. Table C-6 shows the number of pieces of each material type in each analytical unit. Table C-7 shows their distributions by weight. Table C-8 shows the proportions by weight of each type. Table C-9 shows the average piece size, and Table C-10 the density (gm per m3), of each type.

Representative and diagnostic artifacts are illustrated in a series of plates within the text of this chapter.3 Table 5-1

TABLE 5-1: Descriptive statistics for comparing Bliss Islands artifact assemblages.

Provenience:		Lithic:				Ceramic:	Organic:
site name:	analytical unit:	artifact density:	debitage density:	debitage/ artifact:	exotic(%):	artifact density:	artifact density:
Camp:	area I	0.0275	0.0734	3.20	59.29	0.2592	0.0229
	area II	0.0573	1.8893	49.50	55.92	0.5660	0.0153
	area III	0.1390	0.8556	6.40	50.41	0.4864	0.0160
	area IV	0.0712	6.1197	99.53	39.43	0.5786	0.0291
	layer 4	0.0358	0.3322	11.33	70.82	0.0700	0.0000
	layer 3	0.0524	1.2565	28.24	30.20	0.3291	0.0340
	layer 2	0.1053	6.6721	74.91	49.79	1.1850	0.0283
	layer 1	0.2250	8.3000	41.50	67.12	0.8675	0.0250
	total:	0.0748	2.6598	41.21	48.80	0.4866	0.0215
Weir:	stratigraphic component 4	0.0877	1.4035	19.05	47.46	0.0147	0.0386
	stratigraphic component 3	0.0164	0.0246	2.14	12.23	1.3897	0.0328
	stratigraphic component 2	0.0171	0.0205	1.20	12.94	0.7669	0.0102
	stratigraphic component 1	0.0800	0.0933	2.33	48.02	0.0853	0.0400
	total:	0.0443	0.3690	12.94	40.18	0.8583	0.0293
Northeast Point:	---	1.3667	6.4333	4.83	53.23	0.0000	0.0333
Ledge Site:	---	0.0000	0.0000	---	---	0.0000	0.0000
Lighthouse Cove:	---	0.0000	0.0833	---	100.00	0.0850	0.0000
Pintlowes Cove:	---	0.0000	0.1000	---	63.22	0.0000	0.0333

presents a summary of descriptive statistics for comparing the assemblages. For each analytical unit the density (number per lt) of lithic artifacts and debitage, the density (gm per lt) of ceramics, and the density (number per lt) of organic artifacts are shown. In addition, the debitage/artifact ratio (number of pieces of flaked stone debitage per flaked stone artifact) and the proportion of exotic lithic materials in the flaked stone artifact and debitage category are shown.

Weir site artifact assemblages:

Stratigraphic component 1

This assemblage contains a small number, but a high density of lithic artifacts and debitage. The flaked stone assemblage is predominated by black volcanics, green volcanics and green chert. Ca. 50% of the flaked stone is exotic material. The average piece size for lithics is relatively large, and the debitage/artifact ratio is low. These data indicate that little manufacturing of lithic artifacts took place during the deposition of this component. The numbers and densities of ceramic and organic artifacts are low.

Plate 5-1 shows a large ground stone object found at the interface between the subsoil and the black soil layer in unit M3. Stratigraphically, this is the oldest artifact recovered from the Weir site, and either is closely associated with the 2360+/-80bp radiocarbon date or predates it. The upper surface of this artifact is bleached, suggesting that it may have been exposed on the surface prior to the deposition of the black soil.

The artifact was made from a cobble of greenish rhyolite tuff by pecking and grinding. It is oval in shape and circular in crossection, and possesses no culturally diagnostic attributes. It may be a preform for an axe/adze blade; however, evidence of battering on one end suggests that it was used as a maul.

The balance of the artifacts from stratigraphic component 1 were found in or on the black soil layer. Lithics include a large rectangular scraper (Plate 5-2, a), a large transversely fractured unfinished biface (Plate 5-2, d), a fragment of ground slate (Plate 5-2, e), and a notched pebble (Plate 5-2, f) that may have functioned as a line weight. A broken lithic projectile point (Plate 5-2, b), missing the diagnostic stem, is closely associated with the 2270+/-70bp radiocarbon date. The blade of this point has straight margins and a lanceolate triangular shape, with asymmetrical, weakly rectangular shoulders. Similar broken points have been identified as Susquehanna (e.g. Spiess and Hedden 1983:59-60; Tuck 1984:34). However, it is equally possible that it represents a broken contracting stemmed point. The blade of this point was probably originally broader, and was narrowed as a result of resharpening; it may have functioned as the blade of a hafted knife.

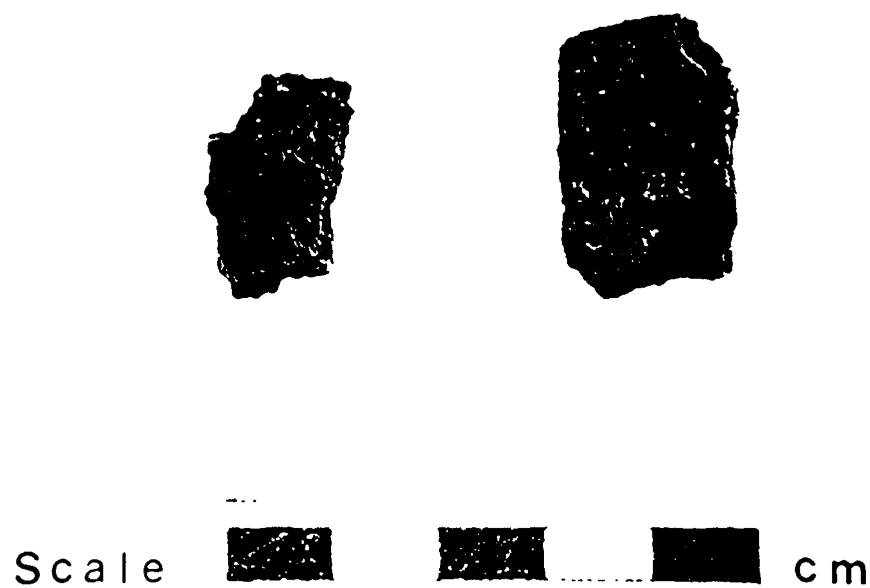
PLATE 5-1: Large ground stone object (rhyolite tuff) found on the contact between the subsoil and stratigraphic component 1 at the Weir site.


Scale
cm

PLATE 5-2: Lithic and organic artifacts from Weir site stratigraphic component 1: a = scraper (green volcanic); b = broken projectile point (green volcanic); c = organic projectile point (mammal bone); d = biface (black volcanic); e = ground stone fragment (banded slate); f = notched pebble (brown metamorphic).

a
b
c
d
e
f
Scale
cm

PLATE 5-3: Ceramic artifacts from Weir site stratigraphic component 1: grit tempered, dentate stamp impressed rim sherd and associated ceramic fragment.


Scale
cm

Two small fragments of grit tempered ceramics were found beneath a rock embedded in the black soil layer (Plate 5-3) in unit M5. The largest of these is a rim sherd from a thin walled vessel with a rounded lip and a slightly outflaring rim. The outer surface immediately below the lip is impressed with closely spaced linear dentate stamping.

Five organic artifacts are associated with this component. Two of these are beaver incisors, both extensively modified on their lingual surfaces and distal ends; distal modifications follow the natural contours of the teeth to produce acutely angled adze-like working edges. The midsection of one of these teeth has a raised facet on the lingual surface similar to the hafted incisor described below from stratigraphic component 3.

Two teeth from a small unidentified carnivore, closely associated with one another in unit N9, were altered for ornamental purposes. Their roots were carved to produce a subrectangular crossection, and holes have been bifacially gouged through the roots. These teeth were probably sewn to clothing or suspended as beads. Also present in this assemblage is a stemmed unbarbed bone projectile or harpoon point recovered from unit P6 during the 1983 test excavation (Plate 5-2, c; Black 1985a:46; Robins and Black 1988:141, 159). This specimen is unlike any other that I am aware of from either the Quoddy region or adjacent areas. It most resembles certain Late Archaic ground slate points (e.g. Snow 1980:198).

Stratigraphic component 2

The number and density of lithic artifacts from this component are very low. Only bifacial artifacts are present. The debitage/artifact ratio is low and the average piece size is large. There is little indication of lithic manufacturing during the deposition of this component. The flaked stone materials are predominantly green and black volcanics, porphyritic rhyolite and quartzite. Ca. 13% of the flaked stone is exotic.

Lithic artifacts include a complete projectile point and parts of two others. The blade of the complete point (Plate 5-4, a) has straight margins and a triangular shape. Rounded shoulders, wide side notches and a slightly concave base give the stem an 'eared' or 'fish-tailed' appearance. The base of a similar projectile point (Plate 5-4, b), with a straight base and less pronounced notches, was closely associated. These points were found in association with a whale vertebra, cervid and large fish bones, and fire cracked rocks in a distinct living floor context in unit N3. The floor is composed of black organic soil mixed with highly fragmented clam shell over a layer of pure cultural gravel. The complete point (shown *in situ* in Plate 5-5) was made from a distinctive red volcanic (probably rhyolite)

PLATE 5-4: Lithic and ceramic artifacts from Weir site stratigraphic component 2: a = wide side notched projectile point (mottled red volcanic); b = base of a wide side notched projectile point (black volcanic); c = grit tempered plain ceramic sherd; d = grit tempered rim sherds decorated with dentate stamp impressions and pairs of small pointed punctates; e = broken projectile point (green volcanic); f = biface (quartzite); g = biface (black volcanic).

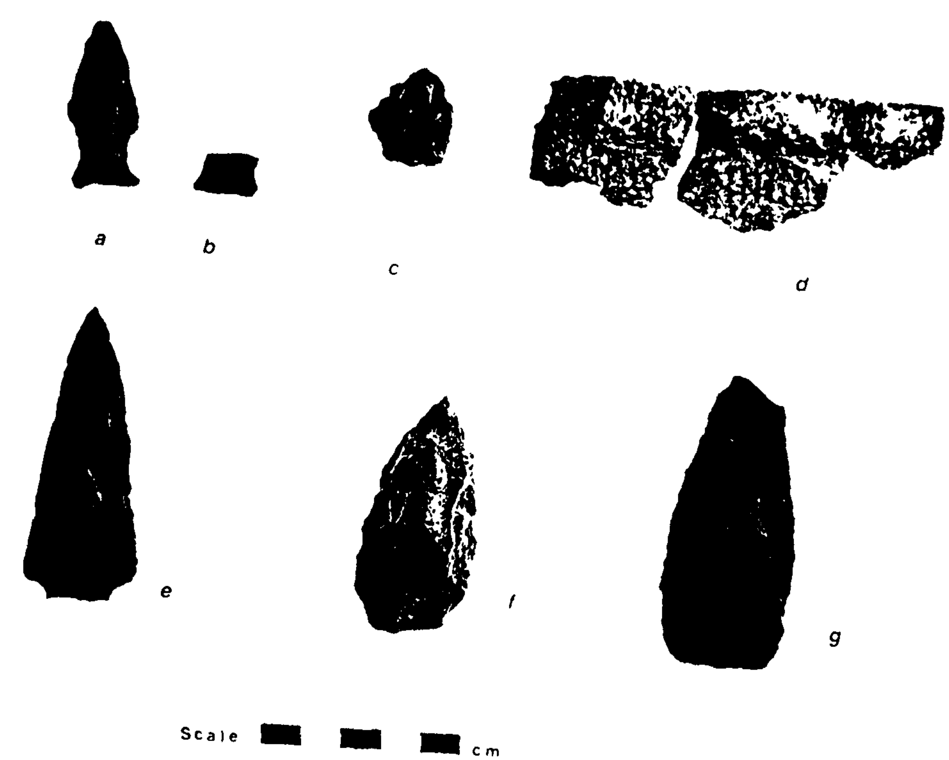
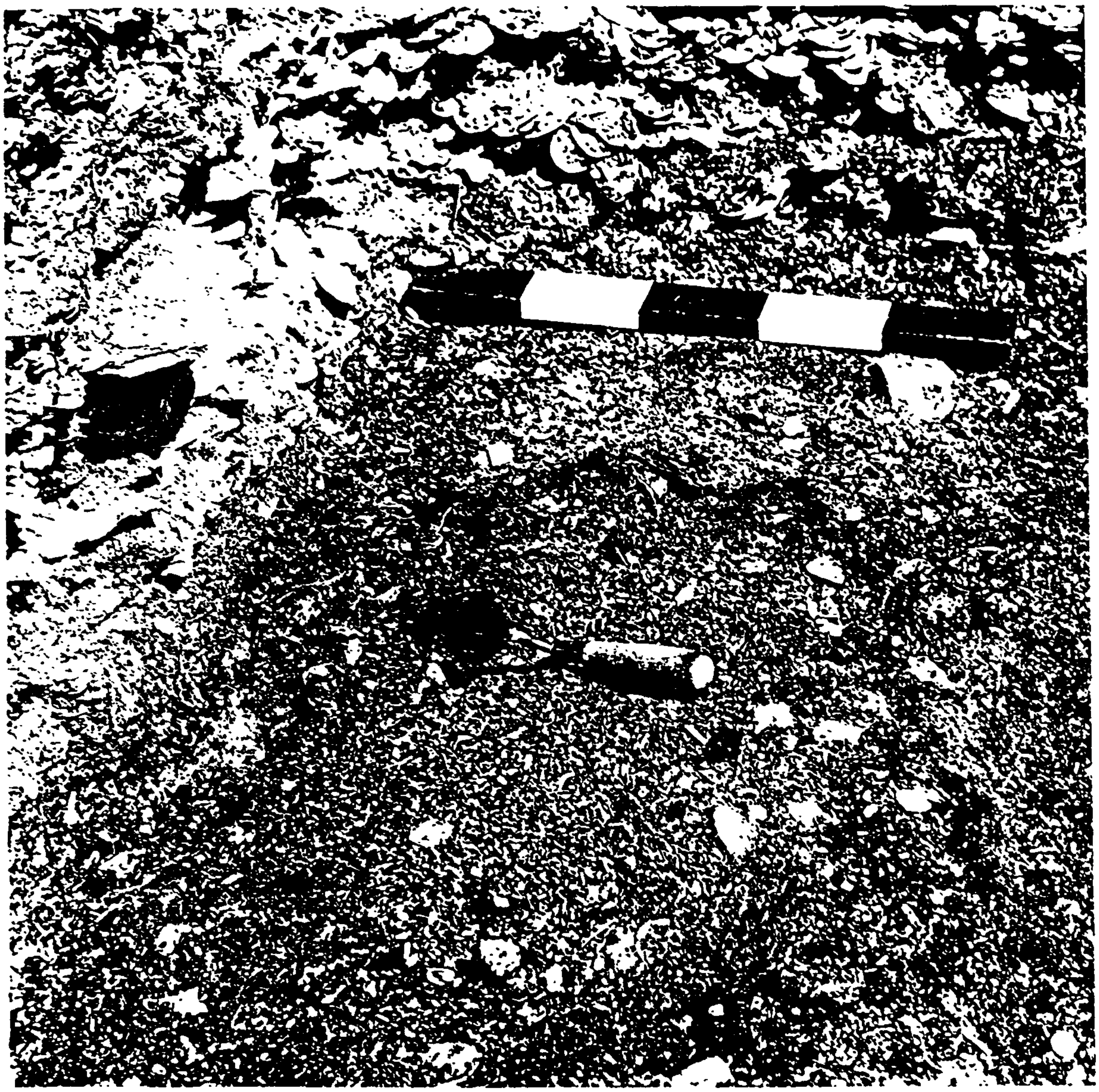

a
b
c
d
e
f
g
Scale
cm

PLATE 5-5: Weir site stratigraphic component 2: wide side notched projectile point *in situ*.

PLATE 5-6: Weir site stratigraphic component 2: broken projectile point *in situ*.

****
LIVING CLOSE TO THE LEDGE



mottled with light brown and black colored patches. It is associated with three flakes of the same material.

Sanger (1987:37-38) suggests that similar wide side notched points from the Carson site date to the Late 'Pre-ceramic' period prior to 3000bp; however, he notes that there is no direct evidence for dating wide side notched points in the Quoddy region. Since the Weir site specimens are in good stratigraphic context, ca. 5cm above charcoal dated to 2360+/-80bp, they suggest a more recent age for this point type.

A broken projectile point (Plate 5-4, e) similar to the one described from stratigraphic component 1, with straight margins, a lanceolate triangular shape and symmetrical rectangular shoulders, was recovered from a thin black soil layer between two sea urchin and clam shell lenses (Plate 5-6). These points are located near one another, and the one from stratigraphic component 2 is only a few cm above the stratigraphic component 1 black soil layer. Thus, these points are probably closely temporally and culturally related.

Two unfinished bifaces (Plate 5-4, f-g) are present in this assemblage. Both were probably discarded because they developed steep hinge fractures which prevented further thinning.

Both the amount and density of ceramics are relatively high in stratigraphic component 2. The sherds tend to be thick and friable; some are tempered with coarse grit and some with finer grit or sand. Some plain sherds (Plate 5-4, c) are present, as well as highly decorated specimens (Plate 5-4, d). Vessel lips are wide and flat, collars are narrow and rims are straight. Punctates positioned along the lower edges of collars are small, round, and appear to have been made with an object resembling a porcupine quill. Closely spaced linear dentate stamp impressions are the predominant decorative motifs. The sherds shown in Plate 5-4 (d) have dentate stamp impressions on both the inside and outside of the rim.

The density of organic artifacts is very low. A single modified beaver incisor, with an extensively modified and utilized tip, is associated with this component. This tooth was modified to produce two converging facets on the distal tip, and may have been used for incising or engraving.

Stratigraphic component 3

The number and density of lithic artifacts and debitage in stratigraphic component 3 are very low. The debitage/artifact ratio is also low, while the average piece size for lithics is relatively large. There is little indication of lithic reduction during the deposition of this component; the few flakes present suggest thinning and retouch of bifacial tools. The flaked stone materials are predominantly quartz, green volcanics and green chert. Ca. 12% of the flaked stone is exotic.

There are no diagnostic flaked stone artifacts in this stratigraphic component, although it represents almost half of the excavated volume of the site. Unifacial tools include a transversely fractured retouched flake (Plate 5-7, b) and 2 utilized flakes. The single biface is a large apparently unfinished specimen of quartz (Plate 5-7), having a thick lenticular crossection and an oval outline with a straight base. Nash (1986:76) illustrates a similar specimen from the Delorey Island site in Nova Scotia. Also present is a bifacially flaked pebble core of black volcanic material (Plate 5-7, a).

A complete ground stone axe blade (Plate 5-8) was found on the surface of a living floor in unit N5. This axe is rectangular in shape and subrectangular in crossection, and has a rounded butt and a double tapered bit. Use wear and microflaking are present on the working edge. It was made from a cobble of dense fine grained metamorphic material by pecking and grinding. Associated with this axe is a large slab of sandstone which was used extensively for grinding and sharpening axe blades of a size similar to the one recovered. Also present in this component are two slightly altered pebbles of metamorphic material which may have functioned as abrading stones.

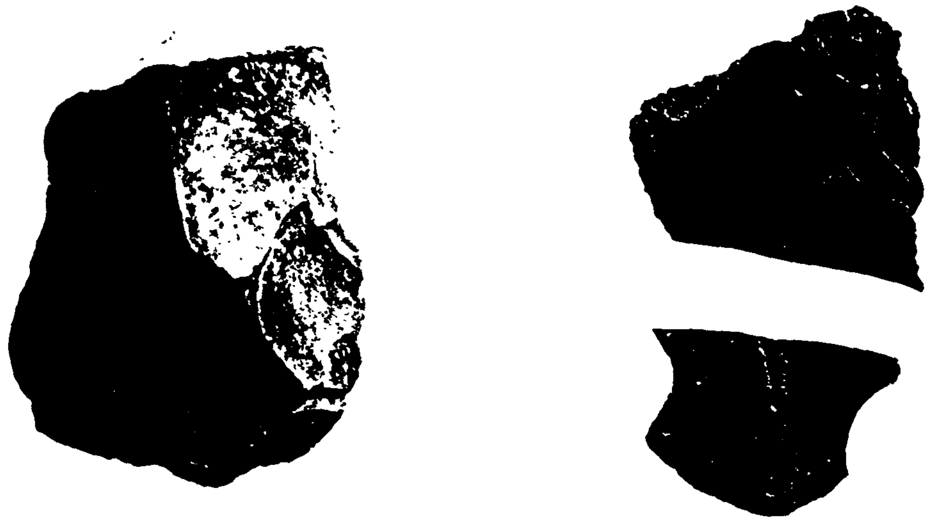
Both the amount and density of ceramics in stratigraphic component 3 are high. Examples are shown in Plate 5-9. Some relatively large portions of vessel bodies have been reconstructed (e.g. Plate 5-9, e-f); unfortunately, rim sherds are rare and fragmentary. The ceramics are relatively thick and friable; all have been tempered with a medium to coarse granitic grit.

The few rims recovered appear to be similar to those from stratigraphic component 2, with wide, flat lips and narrow collars. Closely spaced vertical and oblique rocker dentate stamp (Plate 5-9, b, e-f), and closely spaced linear dentate stamp impressions (Plate 5-9, c-d) are the most common motifs. One rim has small rectangular punctates along the lower edge of the collar (Plate 5-9, c). Several sherds with closely spaced rocker pseudo scallop shell impressions are also present (Plate 5-9, b). In general, these ceramics, and those from stratigraphic component 2 are similar to ceramics recovered by Spiess and Hedden (1983:73-75) from the Kidder Point site in Maine. Spiess and Hedden (1983:185-186) postulate a date range of 2300bp-1700bp for pseudo scallop shell ceramics, based on Peterson's (e.g. 1988) study of the temporal distribution of this motif.

Some possible cord wrapped stick impressions are also present in the upper part of Weir stratigraphic component 3, but are too indistinct to be definitely identifiable. Of particular significance to the discussions later in this chapter are 2 sherds with widely spaced rocker dentate stamp impressions (Plate 5-9, a) found near the top of the component.

There are relatively large numbers, a high density and a wide variety of organic artifacts associated with stratigraphic

PLATE 5-7: Lithic artifacts from Weir site stratigraphic component 3: above, a = bifacial core (black volcanic); b = retouched flake (black volcanic); below, biface (quartz).



a *b*

Scale cm

Scale cm

PLATE 5-8: Weir site stratigraphic component 3: ground stone axe blade (green metamorphic) in situ.

****
LIVING CLOSE TO THE LEDGE

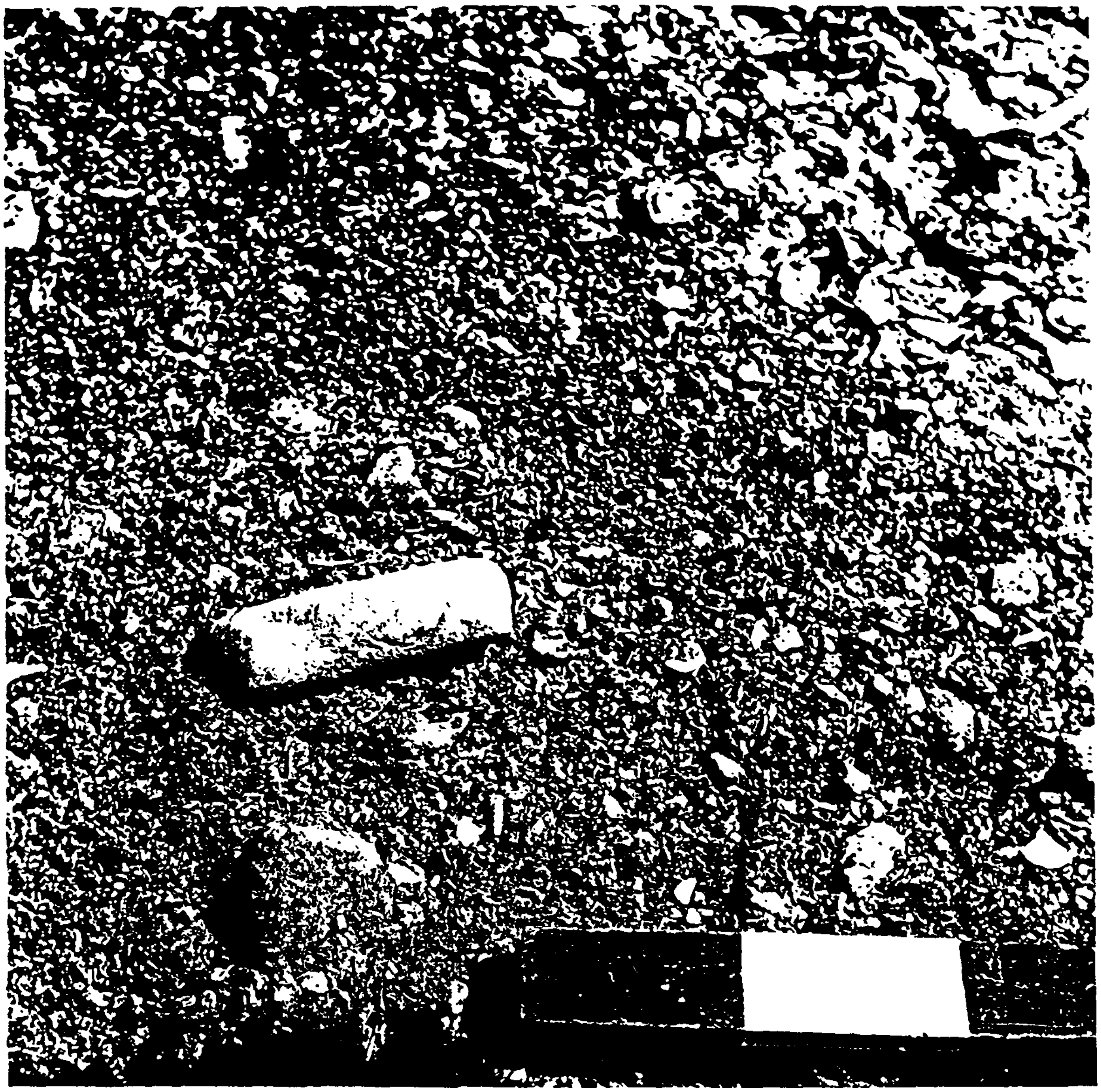


PLATE 5-9: Ceramic artifacts from Weir site stratigraphic component 3: a = widely spaced rocker dentate stamp impressed body sherds; b = closely spaced horizontal rocker pseudo scallop shell decorated body sherd; c = rim sherds decorated with dentate stamp impressions and pointed punctates; d = dentate stamp impressed sherd; e-f = body sherds with closely spaced vertical and oblique rocker dentate decoration. All ceramics are grit tempered.

****
LIVING CLOSE TO THE LEDGE

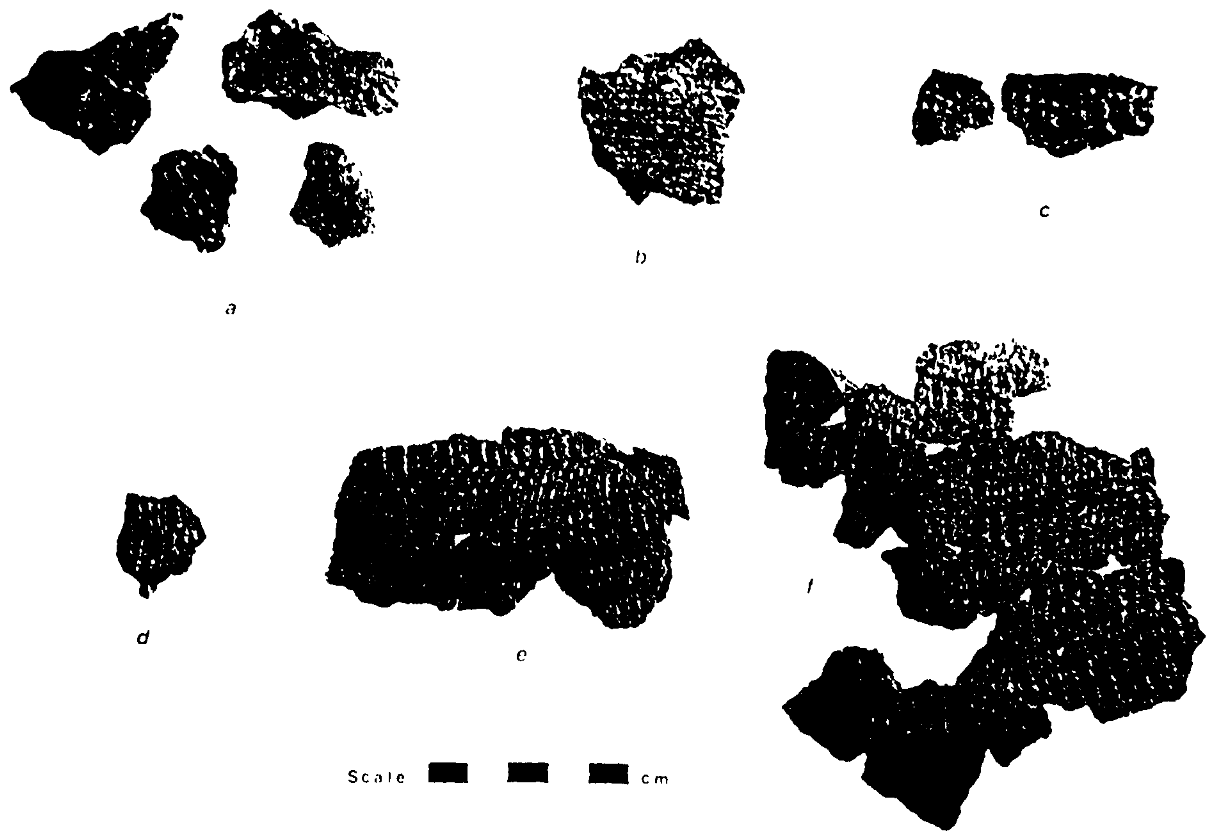

a
b
c
d
e
f
Scale
cm

PLATE 5-10: Organic artifacts from Weir site stratigraphic component 3: a = modified scallop shell; b = hafted beaver incisor tool.

a *b*

Scale cm

component 3. These include 7 modified rodent incisors, 4 awls, 3 needles, 2 pieces of bone working debitage, a slightly modified canid tooth and 2 modified scallop shells.

The awls are extensively modified sections of mammal extremity bone cortex, subrectangular to oval in crossection and tapering to blunt rounded points. The needles are made from extensively modified strips of mammal cortical bone, plano-convex in crossection and tapering slightly to rounded spatulate points at both ends. Oval eyes are gouged bifacially through the centers of the needles, and typically the needles are broken at the eye. The awls and needles were probably used for basketry, netting, sewing and hide working.

Most of the rodent incisors are only slightly modified on the lingual surfaces, but extensive modified on the distal occlusal surfaces. Distal modifications include adze-like working edges at acute angles to the length of the tooth, and knife-like working edges perpendicular to the length of the tooth. One of the modified incisors was recovered in anatomical position in the left mandible of a juvenile beaver. Presumably, the mandible served as a handle for this tool. Another extensively modified incisor was found hafted in a handle made from a deer antler tine (Plate 5-10, b). The incisor itself was carved on the lingual surface to make the tooth thinner and more rectangular in crossection. A raised triangular facet was left on the lingual surface to prevent the tooth from sliding completely through the haft. The distal occlusal surface was modified to produce an acutely angled adze-like working edge perpendicular to the haft. The antler handle is smoothed and highly polished. The incisor was inserted into a bifacially gouged slot through the cancellus bone at the base of the tine. Originally, it was probably held in place with an organic cord binding. Both of the modified scallop shells are lower valves. The edges of the smaller one were ground to give the valve an almost circular outline. The larger specimen (Plate 5-10, a) has crescent shaped indentations ground into the edges of the valve to produce a roughly hexagonal shape. The latter was found concave side up on the surface of a living floor in unit N6. The functions of these artifacts are unknown; although most large shell middens excavated in the Quoddy region have yielded at least 1 or 2 scallop shells, these have not previously been recognised as artifacts. With the exception of the hafted beaver incisor tool and the scallop shell artifacts, most of the organic artifacts from this stratigraphic component occur near the (upper) interface with stratigraphic component 4.

Stratigraphic component 4

The number and density of lithic artifacts and debitage from stratigraphic component 4 are very high in comparison to the lower stratigraphic components. The debitage/artifact ratio is also high, although the average piece size for lithics is much smaller than in the lower stratigraphic components. The flaked stone includes a wide variety of materials: quartz, quartzite, red, brown and green cherts, black, brown and green volcanics, mudstone, siltstone and metasediments. Ca. 48% of the flaked stone material is exotic.

The assemblage includes 5 bipolar cores (e.g. Plate 5-11, a) of quartz and red chert, and 3 pebble cores of quartz, quartzite and red chert. The pebble cores may also have been worked with a bipolar technique. An unflaked pebble of green chert, probably curated as raw lithic material, is also present.

Primary and secondary cortical flakes, and thinning, retouch and resharpening flakes indicate that all stages of lithic reduction are represented in this assemblage. Ca. 60% of the debitage results from the production of bifacial artifacts, but the presence of the cores discussed above, and numerous blocks, shatter and amorphous fragments reflect a bipolar element in the lithic technology of this assemblage. This bipolar element is not present in the assemblages from the lower stratigraphic components.

Unifaces include 1 retouched flake of red chert, 2 utilized flakes of quartzite and mudstone, and seven scrapers. The scrapers (e.g. Plate 5-11, d-e) are small rounded to triangular specimens made from quartz, red mudstone and red and brown cherts.

Three bifacial artifacts are associated with this component.

The first is the triangular tip from a biface or projectile point of green volcanic material (Plate 5-11, b). The second is a complete projectile point of black siltstone (Plate 5-11, c). The blade of this point has symmetrical excurvate margins, a thin lenticular crossection and a sharp point. The notches are small, narrow and close to the slightly concave base. Similar points have usually been assigned to the 'Late Ceramic Period' (ca. 1000bp-350bp) by Sanger (1986:146). These types of points are relatively common in Maine/Maritimes archaeological assemblages.

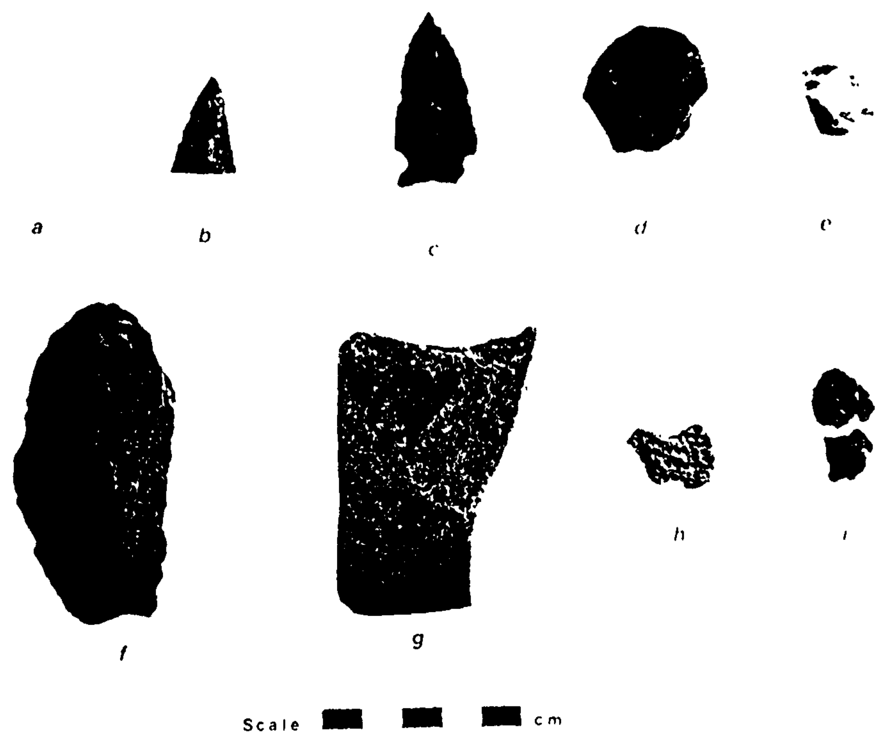
The third biface is a larger unfinished specimen of quartzite (Plate 5-11, f) probably discarded because of irregularities in the material.

There are no ground stone artifacts in this assemblage. However, two slabs of metamorphic material (e.g. Plate 5-11, g) were used as abraders.

The amount and density of ceramics in stratigraphic component 4 are very low. All of the ceramics are small friable body sherds; ca. 50% are grit tempered and 50% shell tempered. Decorative motifs include rocker dentate stamp impressions and cord wrapped stick impressions.

The number and density of organic artifacts in stratigraphic component 4 are relatively high. These include 7 modified rodent incisors, 2 awls, 1 bone artifact tip, and 1 piece of bone working debitage. One of the awls is made of mammal bone cortex and is similar to those from stratigraphic component 3. The other is

PLATE 5-11: Lithic and ceramic artifacts from Weir site stratigraphic component 4: a = bipolar core (quartz); b = biface tip (green chert); c = narrow side notched projectile point (black siltstone); d = scraper (brown chert); e = scraper (red chert); f = biface (quartzite); g = abrading stone (green metamorphic); h = grit tempered, dentate stamp impressed ceramic sherd; i = shell tempered ceramic sherds.


a
b
c
d
e
f
g
h
i
Scale
cm

made from the extensively modified midsection of an extremity bone of a large bird. The bone tip is highly polished, and may represent part of a projectile point or harpoon.

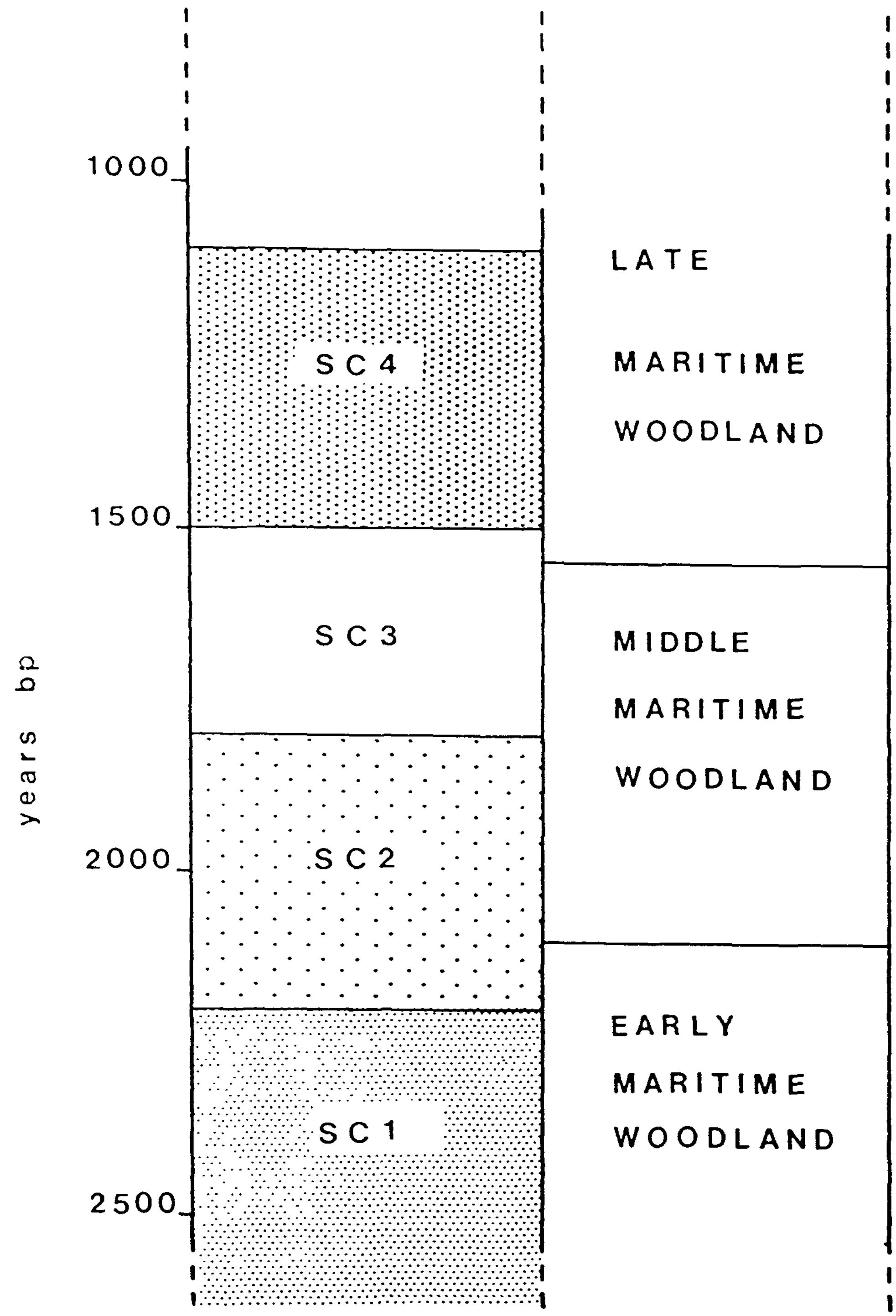
The incisor tools are slightly altered on the lingual surfaces and extensively altered on the distal occlusal surfaces. Two have sawn bases. Three were modified to form adze-like working edges, and 3 were split and modified to form knife-like working edges.

Culture history interpretations of the Weir site:

In Figure 5-1 I present a model of the culture history of the Weir site, showing the relationships between the stratigraphic components and cultural components defined. This model divides the culture history of the site into three periods of occupation: i) an Early Maritime Woodland period dating prior to ca. 2100bp; ii) a Middle Maritime Woodland period dating from ca. 2100bp to ca. 1600bp; and iii), a Late Maritime Woodland period dating from ca. 1600bp until the beginning of the formation of the peat soil at ca. 1000bp. In stratigraphic terms, the Early Maritime Woodland cultural component includes stratigraphic component 1 and the lower layers of stratigraphic component 2, the Middle Maritime Woodland component includes the upper layers of stratigraphic component 2 and most of the floor and midden deposits in stratigraphic component 3, and the Late Maritime Woodland includes the transitional interface between stratigraphic components 3 and 4 and stratigraphic component 4 proper. The distinguishing characteristics of the artifact assemblages from each of the proposed culture history periods are summarised below.

The most striking technological differences are between the Early Maritime Woodland and Middle Maritime Woodland components on one hand, and the Late Maritime Woodland component on the other. The earlier lithic assemblages are characterized by : i) relatively small numbers of lithics of relatively large size; ii) bifacial reduction; and iii) relatively low proportions of exotic lithic materials. The Late Maritime Woodland lithic assemblage is characterized by: i) relatively large numbers of lithics of relatively small size; ii) bifacial and bipolar reduction; and iii) a relatively high proportion of exotic lithics. While the Early Maritime Woodland and Middle Maritime Woodland assemblages contain relatively few organic artifacts, the Late Maritime Woodland assemblage contains a large number and wide variety of organic artifacts. The Early Maritime Woodland assemblage contains only a couple of sherds of grit tempered ceramics; the Middle Maritime Woodland assemblage contains large amounts of grit tempered ceramics; the Late Maritime Woodland assemblage contains small amounts of grit and shell tempered ceramics.

FIGURE 5-1: Diagrammatic representation of the relationship between stratigraphic components and culture history periods in the Weir site.


years bp
1000
1500
2000
2500
SC4
SC3
SC2
SC1
LATE MARITIME WOODLAND
MIDDLE MARITIME WOODLAND
EARLY MARITIME WOODLAND

Stratifying the Camp site:

Artifact assemblages

The Camp site contains a large number and a high density of lithic artifacts and debitage. The flaked stone assemblage is predominated by quartz, green chert, green volcanics, black volcanics, red chert, brown chert, quartzite and mudstone. Ca. 50% of the lithics are exotic. The average piece size is relatively small and the debitage/artifact ratio is relatively high. These data indicate that a great deal of lithic reduction took place during the occupation of the site.

The artifact assemblage is described as a single entity here, because the site is shallow, indistinctly stratified, and has been disturbed by historic activity. However, there are significant spatial and stratigraphic variations in the distribution of artifacts within the Camp site. Stratigraphically, the highest densities of lithic artifacts and debitage, and ceramics are associated with layer 2, the living floors and features. Organic artifacts and bone working debitage, on the other hand, are most frequently associated with layer 3, the shell deposit. The vast majority of prehistoric materials of all types are associated with layers 2 and 3. Artifacts from layer 1 are few in number, but occur at a high density because this layer is effectively an interface, and accounts for little volume. Prehistoric artifacts occur both in low numbers and at a low density in layer 4;

however, most of the historic artifacts are associated with this upper layer.

Spatially, lithic artifacts in the Camp site tend to be concentrated on the east side of the excavation block, in areas II and IV. In area II most of the lithics are black and green volcanics and green chert; the highest densities are associated with layers 1 and 2. In area IV most of the lithics are quartz, and red and green chert; the highest densities are associated with layers 2 and 3. Area II has the lowest proportion of exotic lithics because a great deal of local quartz was worked by bipolar percussion in this area. However, most of the bipolar cores occur in area III, which has a low density of lithic debitage.

Primary and secondary cortical flakes, and thinning, retouch and resharpening flakes are present. These indicate that all stages of lithic artifact manufacture and use are represented at the site. Ca. 30% of the flaked stone debitage is from bifacial reduction while ca. 70% is from bipolar reduction. Large numbers of irregular blocks and small pieces of shatter (especially of quartz, but also red chert and quartzite) indicate that the bipolar working of small pieces of lithic material was a common activity at the site. The assemblage also contains 12 bipolar cores (e.g. Plate 5-12, f-h) of white and semi-translucent crystalline quartz, quartzite and red chert. Only one core, of red chert, is not obviously bipolar; it resembles a unidirectional microblade core, but this resemblance is probably fortuitous.

PLATE 5-12: Lithic artifacts from the Camp site, scrapers and bipolar cores: a = scraper (bleached chert); b = scraper (red chert); c = scraper (brown chert); d = scraper (red chert); e = scraper (red mudstone); f = bipolar core (quartz); g = bipolar core (quartz); h = bipolar core (quartzite).

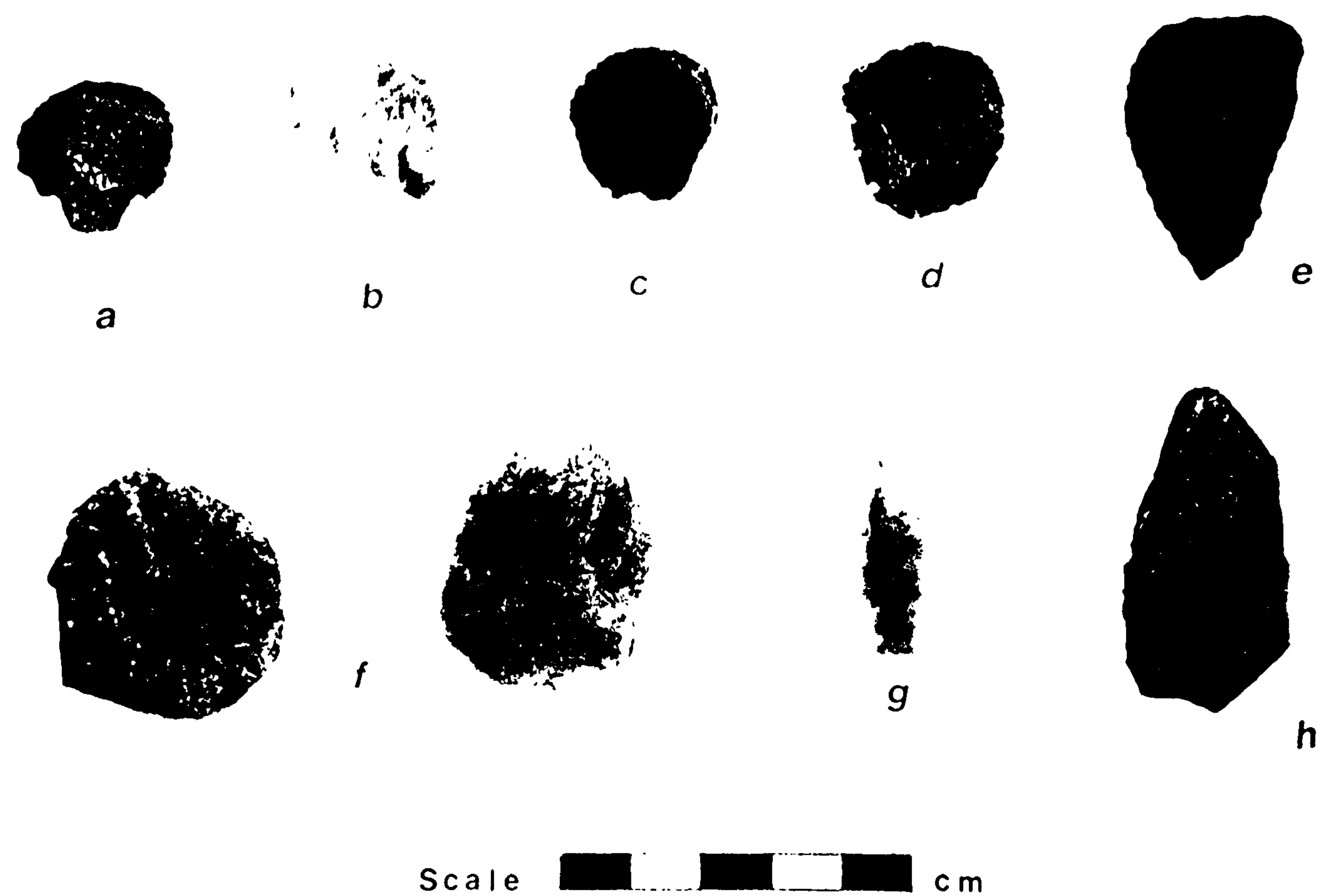
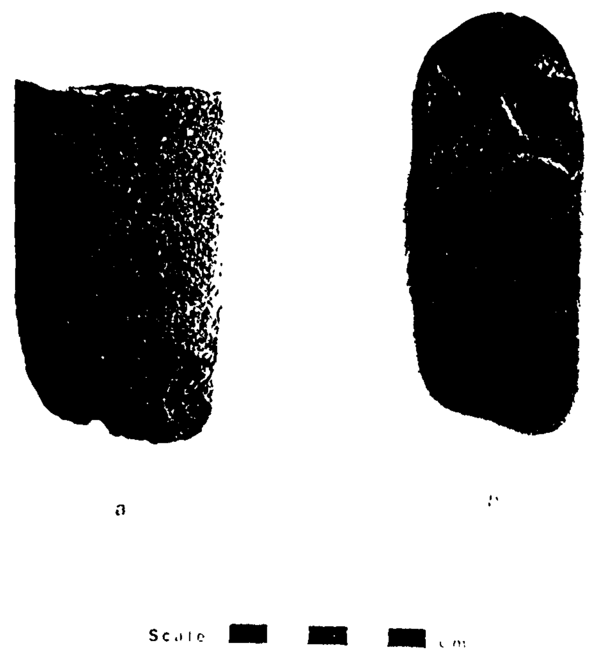

a
b
c
d
e
f
g
h
Scale
cm

PLATE 5-13: Lithic artifacts from the Camp site, bifaces and projectile points: a = expanding stemmed projectile point (mottled red volcanic); b = contracting stemmed projectile point (bleached black metasediment); c = broken (side notched?) denticulated projectile point (green chert); d = unfinished corner notched projectile point (quartzite); e = narrow side notched projectile point (bleached chert); f = biface tip (green volcanic); g = biface tip (green volcanic); h = biface base (red mudstone); i = biface (brown chert); j = biface (green chert).


a
b
c
d
f
g
h
j
Scale
cm

PLATE 5-14: Lithic artifacts from the Camp site, ground stone: a = base of ground stone object (green metamorphic); b = ground stone axe blade (black metamorphic).


a
b
Scale
cm

Despite the presence of these cores and the large amounts of lithic debitage, only one hammerstone, a split cobble with battered ends, was identified in the assemblage.

Unifacial tools include 16 small triangular endscrapers and circular thumbnail scrapers (e.g. Plate 5-12, a-e); most are made from flakes of red chert, but quartz, brown and green chert and red mudstone examples are also present. The scrapers range from those little more formal than retouched flakes (e.g. Plate 5-12, a) to a composite tool of red mudstone having a scraperized distal end and a truncated lateral margin opposite a use worn lateral cutting edge (Plate 5-12, e; Black 1985a:33-34).

Seven retouched flakes and 2 utilized flakes of quartz, red and green chert, black volcanic and black siltstone are the only other unifacial tools present. Two of the retouched flakes could be interpreted as gravers.

The assemblage contains 5 lithic projectile points (Plate 5-13). The first is a small wide side notched point made from mottled red volcanic material (Plate 5-13, a). The notches are relatively weak and rounded and the base straight, giving the stem a somewhat fish-tailed appearance. The shoulders are rounded, the blade margins slightly excurvate, and the tip broken, resulting in a blade with a nearly oval outline. The edges of the blade are steeply retouched, suggesting that the point may have been discarded because the blade was retouched until effectively used up. This point is made from the same material as the fish-tailed projectile point from Weir site stratigraphic component 2 and probably dates to the same time period. Allen (1981:338-339) has dated similar points at ca. 2500bp at the Oxbow site.

The second is a relatively large contracting stemmed point made from black metasediment (Plate 5-13, b). The shoulders of this point are pronounced but rounded. The stem tapers to a blunt slightly rounded base. The blade is lanceolate triangular in shape, and the blade margins straight. One side of the point is bleached, suggesting that it was exposed on the surface for some time. Allen (1981:338-339) has dated contracting stemmed points from ca. 1700bp to ca. 2200bp at Oxbow. Sanger (1986:146) indicates that similar points date to the 'Early and Middle Ceramic Period' in the Quoddy region.4

The third point is an incomplete specimen made from green chert (Plate 5-13, c). It was found on the surface of the site; one side of the point is bleached, indicating that it was exposed for some time. The stem and tip are broken; however, the point was probably either narrow side or corner notched. The blade margins are straight but serrated, and the blade lanceolate triangular in shape. Sanger (1987:121) notes that similar serrated points are common in 'Late Ceramic Period' sites in the Quoddy region.

The fourth projectile point is a weakly corner notched specimen made from grey quartzite (Plate 5-13, d). The base is straight but unthinned, suggesting that the point was lost or discarded before being finished; this may account for the poorly developed corner notches. The blade margins are excurvate and the tip blunt. Sanger (1986) indicates that small corner notched projectile points date to ca. 1000bp and later in the Quoddy region. Allen (1981:338-339) indicates a date of ca. 1000bp for similar points at Oxbow. Nash (1986:25-28) suggests a date of AD1000 or later for similar points at the Delorey Island site; however, they may date earlier since Nash accepts radiocarbon ages as early as ca. 1600bp for occupations at Delorey Island.

The fifth is a narrow side notched projectile point of bleached brown chert (Plate 5-13, e). This point has a straight base which has been thinned and ground. The notches are shallow but symmetrical and well defined, giving the base of the point a rectangular appearance. The margins of the blade are excurvate, converging to a sharp point. The point in very thin and finely fashioned.

The similarities between this point and the side notched points from the Northeast Point site and Weir site stratigraphic component 4 suggest that it belongs to the early part of the Late Maritime Woodland period (ca. 1500-1100bp). In general, however, narrow side notched points are considered to date to the 'Late Ceramic Period' (ca. 1000-350bp) in the Quoddy region. To further complicate the issue, narrow side notched points with rectanguular bases are considered diagnostic of the Early Woodland Meadowood culture in southern New England (e.g. Snow 1980:288). Similar points have sometimes been attributed to the 'Early and Middle Ceramic Period' (e.g. Sanger 1986:146) in the Maine/Maritimes area, and narrow side notched points, associated with pseudo scallop shell ceramics, have also been attributed to Meadowood occupations at the Kidder Point site at the mouth of the Penobscot River in Maine (Spiess and Hedden 1983:186). Deal (1986:83-85) assigns points with almost identical base forms to the 'Late Ceramic period' at the Mud Lake Stream site in the St. Croix drainage, a site which he has argued contains a Meadowood component.

Eleven complete or broken unstemmed bifaces (Plate 5-13, h-j) were recovered. These are made from quartz, red, brown and green chert, and red mudstone. With one exception these are relatively small (ca. 5cm) and range from crudely flaked specimens broken during manufacture (e.g. Plate 5-13, i) to finely shaped and thinned specimens (e.g. Plate 5-13, h) that may represent blanks for projectile points. The exception (Plate 5-13, j) is a large (12.5cm), carefully shaped and thinned green chert biface with an elongated pointed oval shape. This specimen was recovered from the top soil layer and is bleached on one side.

Other bifacial artifacts include 5 biface tips (e.g. Plate 5-13, f-g) of red and green chert, and black and green volcanics. These tips are relatively small, triangular in shape, sharply pointed and truncated by transverse bending fractures. They probably represent projectile points or unstemmed bifaces broken during manufacture or use.

Only 2 ground stone tools were recovered from the Camp site. One (Plate 5-14, a) may be the base of an adze/axe blade. It was made from a green crystalline metamorphic material, and has been battered at the distal end and transversely fractured. The other (Plate 5-14, b) is a small complete adze/axe blade made from a cobble of fine grained black volcanic or metasediment. This piece has been partially pecked and ground; some of the natural cobble surfaces remain. The blade is semi-circular in outline and double tapered in crossection. It bears some evidence of use wear.

The assemblage includes two tabular pieces of crystalline metamorphic material that appear to have been used as abrading stones. Other possible lithic artifacts include several beach rolled cobbles and pebbles of crystalline materials that may have functioned as hammerstones or weights. Finally, several pieces of a red ochre-like material,perhaps used for making pigments, were found.

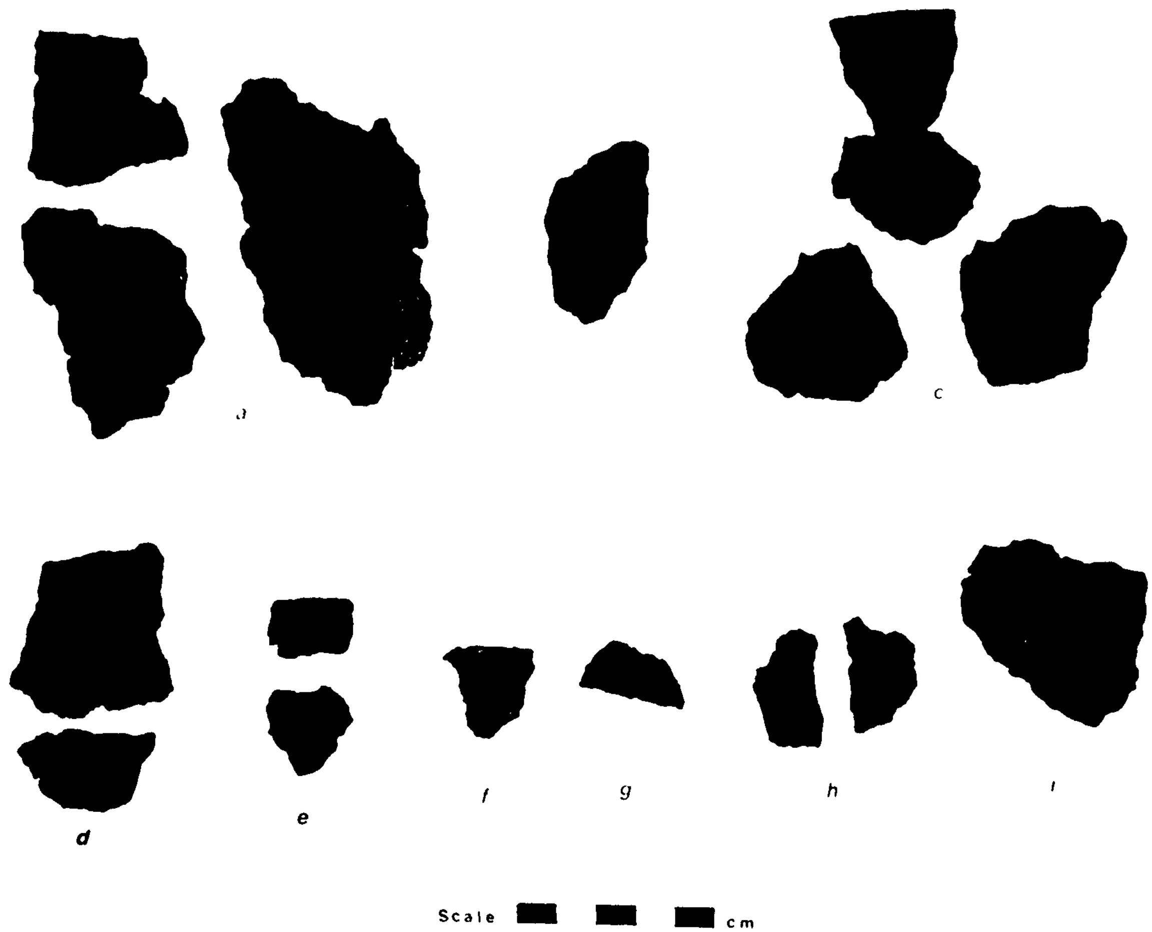
In general, the Camp site contains a much smaller amount and lower density of ceramics than the Weir site. High densities of ceramics are associated with layers 1 and 2. The entire range of ceramic decorative motifs present in the site are associated with the living floors in layer 2. The Camp site ceramics are all grit tempered with one possible exception. A single plain body sherd displays pits that may represent places where shell tempering has been leached out (Crowe 1986); however, this sherd also contains coarse grit temper.

There are two types of ceramics represented at the site: i) thick, friable poorly fired, dull brown colored vessels, and ii) thin walled, harder, well fired orange colored vessels. The former have squashed lips with drag stamp impressed surfaces, large circular punctates on the rims, and rims and bodies decorated with loosely spaced vertical and oblique rocker dentate stamp impressions (e.g. Plate 5-15, a-c). Similar rocker dentate motifs are widely reported from sites in the Maritimes (e.g. Bishop 1983a; Smith and Wintemberg 1973:44, 146-147). Some of the thick walled vessels are also decorated with cord wrapped stick impressions (e.g. Plate 5-15, h-i).

The thin walled vessels have rounded lips with narrow collars and castellations, and rims and bodies decorated with loosely spaced pseudo scallop shell motifs (e.g. Plate 5-15, d-e). A few sherds from similar vessels were decorated with dentate stamp impressions, notched lips and linear trailed motifs (Plate 5-15, f-g). Pseudo scallop shell ceramics similar to these have been reported from an 'Early Woodland' context at the Kidder Point site (Spiess and Hedden 1983:67, 186).

Ceramics, like lithics, tend to be concentrated on the east side of the excavation block at the Camp site. Pseudo scallop shell decorated ceramics are restricted in distribution to layer 2

PLATE 5-15: Ceramic artifacts from the Camp site: a-c = rim and body sherds with drag stamp impressed lip, round punctates and widely spaced horizontal and oblique rocker dentate stamp impressions; d-e = rim and body sherds with widely spaced rocker pseudo scallop shell decoration, collar and castellation; f = rim sherd with notched lip and dentate stamp impressions; g = body sherd with linear trailed decoration; h-i = body sherds with cord wrapped stick impressions. All ceramics are grit-tempered.


a
c
d
e
f
g
h
i
Scale cm

in area II, while most of the dentate stamp and cord wrapped stick impressed ceramics are associated with areas III and IV.

Organic artifacts are more evenly distributed, although incisor artifacts are clustered toward the centre of the excavation block (Robins and Black 1988:150-151). Organic tools recovered from the Camp site include 4 modified rodent incisors, 2 bone awls, 2 bone needles, 2 barbed bone points, 5 bone tips, and 6 pieces of bone working debitage.

All four of the rodent incisors are medial and distal portions with the distal tips extensively modified. Two have been modified along the natural contours to form adze-like working edges; two have been split longitudinally to form knife-like working edges.

One of the bone awls is made from the midsection of a deer or caribou ulna, the other from the midsection of a longbone from a large bird. The bone needles are made from extensively modified strips of mammal cortical bone; these are plano-convex in crossection, have blunt tips, and oval eyes gouged through their centers. Both needles are broken at the eyes.

The barbed bone artifacts are made from mammal bone and probably represent harpoon points. Neither is complete; the larger of the two specimens is an elongated oval in outline, and lenticular in crossection. Both are unilaterally barbed, one with a single barb, the other with two barbs.

Four of the bone tips represent tips of bone awls or needles; the fifth represents the tip of a bone harpoon or projectile point. All are made from mammal bone.

The bone working debitage includes five pieces of mammal longbone which have deep grooves incised into them. These indicate that the groove and splinter technique was used for producing blanks for bone artifacts. The Camp site has a low density of organic tools compared to the Weir site, but relatively much more bone working debitage. This suggests that, in contrast to the Weir site, the Camp site was a place where bone tools were manufactured.

Test units outside the main excavation block (Black 1985a:34-35) indicate that the density of artifacts and lithic debitage is much lower in the shell-rich areas of the site. This observation is substantiated within the excavation block itself, where area I, which has the highest density of shell, has the lowest densities of other cultural materials.

Temporal and cultural affiliations:

Although the Camp site has undergone considerable disturbance, the data presented in the preceding section suggest that some structural integrity remains in the artifact assemblage. I interpret the artifact distributions as indicating, in a general way, an early-late trend from the landward to the shoreward ends of the excavation block, and from the lower to the upper layers of the site. The clustering of the wide side notched projectile point, the contracting stemmed projectile point, and the concentration of relatively large pieces of volcanic lithic debitage in area II (especially units D5, E4 and E5) indicates Early and Middle Maritime Woodland occupations at the site. These indications are further strengthened by the presence of pseudo scallop shell ceramics in the same area, and a possible Meadowood projectile point. It is probable that further excavations at the Camp site, especially north of the 1986 excavation block, would reveal substantial Early and Middle Woodland occupations.

As noted in the previous chapter, there is some evidence for a significant hiatus in occupation at the Weir site, at least in the area of the main excavation block. This hiatus probably took place from ca. 1600bp to ca. 1300bp. I suggest that the focus of occupation on the islands changed from the Weir site to the Camp site at ca. 1600bp, and that the bulk of the prehistoric material recovered from Camp fits temporally into this hiatus in occupation at Weir.

Most of the lithic and organic artifacts from the Camp site, especially those from areas III and IV, closely resemble those from Weir site stratigraphic component 4. These lithic assemblages share the following traits: i) large amounts of lithic debitage but relatively small piece sizes; ii) bifacial and bipolar reduction; and iii) a high proportion (ca. 50%) of exotic lithics. Both assemblages include relatively high densities of small round and triangular scrapers. Similar organic artifacts, small bone awls, needles with central eyes, and minimally altered beaver incisors are present in both. In these respects, the Camp site and Weir stratigraphic component 4 assemblages are similar to the 'Late Ceramic Period' assemblages described by Sanger (1987:120-122) from the northern shore of Passamaquoddy Bay. Except for the specific projectile point types, the Camp site lithic assemblage is similar to that from the Wheeler's site in Massachusetts in terms of the artifacts present (Barber 1982:28ff) and the high proportion of exotic lithic materials (Barber 1982:53).

However, the ceramics from the Camp and Weir sites, except for the pseudo scallop shell sherds discussed above, and the two widely spaced rocker dentate sherds recovered from the upper part of Weir stratigraphic component 3, are quite different. On the basis of this difference in ceramics, I suggest that the Camp site Late Maritime Woodland assemblage dates to the earlier part of that period, in the range between ca. 1600bp and ca. 1300bp. Typologically, the Camp site rocker dentate and cord wrapped stick ceramics fit well between the earlier Weir site ceramics and the later ceramics from the Quoddy region, exemplified by those from the Carson site (Sanger 1987) dating to ca. 1000bp. The Camp site specimens share a number of traits with the Carson ceramics, such as thickness, fragility, dark colors, poor firing, squashed lips, and round punctates. However, they retain a number of traits generally considered to be earlier; for example, virtually all of the Camp site sherds are grit tempered rather than both grit and shell tempered,5 most are rocker dentate rather than cord wrapped stick impressed, and the round punctates are associated with rocker dentate rather than cord wrapped stick impressions.

In general, the ceramics from the Wheeler's site (Barber 1982:38ff) are similar to those from Camp. The Wheeler's assemblage contains both grit and shell tempered sherds; this is not surprising since, temporally, it falls between Camp and Carson. Some of the Camp site rim sherds (e.g. Plate 5-15, c) are strikingly similar to the Wheeler's Punctate-Dentate ceramic type defined by Barber (1982:45-46).

There is also some evidence for a protohistoric occupation at the Camp site. This takes the form of circular cobble features in the topsoil layer near the shoreward edge of the excavation block, and a radiocarbon date in the protohistoric range associated with a small pit feature containing cod fish bones (Black 1985a). No artifacts can definitely be associated with these features. By itself this evidence is not very convincing, since charcoal dating in this range could be the result of the historic occupations at the site. However, the proximity of the Camp site to the Ledge site, and the similarity of the radiocarbon dates obtained from the two sites, suggest that a protohistoric occupation at Camp is likely.

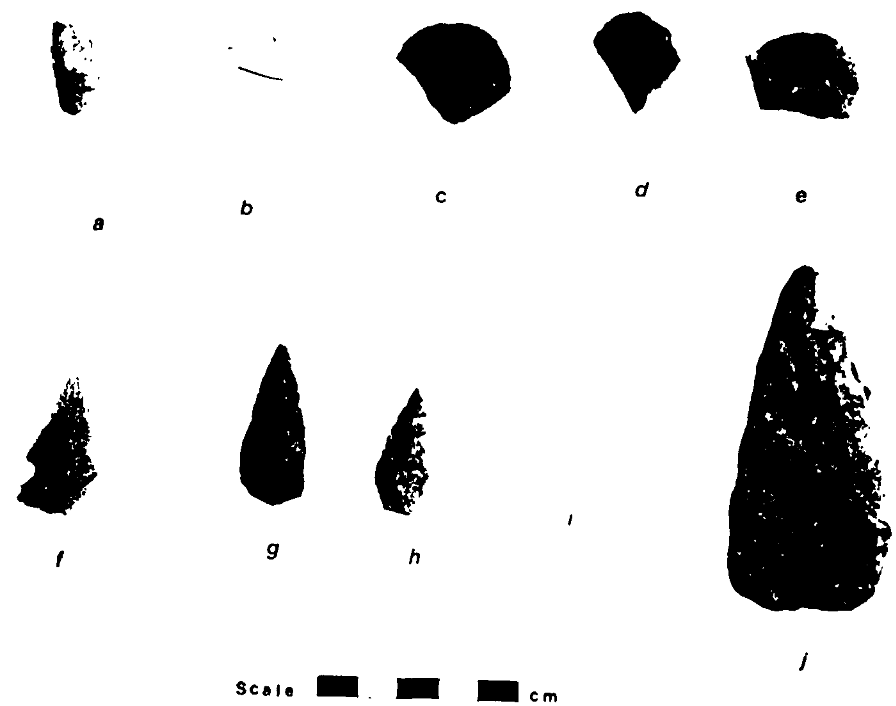
The Northeast Point site:

This site contains the largest number of lithic artifacts and highest artifact density of any of the Bliss Islands analytical units. It also contains a relatively high density of lithic debitage. The average piece size for lithics is small. The debitage/artifact ratio, while larger those of Weir stratigraphic components 1, 2 and 3, is smaller than those of the Camp site and Weir stratigraphic component 4. The lithic materials are predominantly quartz, quartzite and cherts of all three colour groups. Ca. 54% of the lithics are exotic.

The flaked stone assemblage suggests that artifacts were both manufactured and used at the site. There is little indication of primary flaking especially of exotic materials, suggesting that these were brought to the site as finished or partially finished artifacts. Much of the debitage represents bifacial thinning and retouch flakes. The presence of 5 bipolar cores (e.g. Plate 5-16, a) indicates the working of small pieces of lithic material using the bipolar technique.

The most common tools in this assemblage are small round thumbnail scrapers and triangular endscrapers made from both local and exotic materials (e.g. Plate 5-16, b-e). Retouched and utilized flakes are also present. A large biface was found on the

PLATE 5-16: Artifacts from the Northeast Point site: a = bipolar core (quartz); b = scraper (quartz); c = scraper (red chert); d = scraper (quartzite); e = scraper (brown chert); f = large beach rolled biface (bleached green chert); g = small biface (grey chert); h = small biface (bleached chert); i = broken projectile point (quartz); j = narrow side notched projectile point (quartz).


a
b
c
d
e
f
g
h
i
j
Scale
cm

beach adjacent to the site (Plate 5-16, f). In the site itself two small bifaces (Plate 5-16, g-h) and 2 biface tips were found. All of the bifaces were made from bleached green chert.

Two projectile points, made from locally available white crystalline quartz, are associated with this site. A small point with a triangular blade and a broken, possibly bifurcate, stem (Plate 5-16, i) was found in situ. A larger narrow side notched point with a triangular blade and a wide straight base (Plate 5-16, j), was found eroding from the site during the 1981 survey. Sanger (1987:38) illustrates the base of a similar quartz point from the Carson site.

No ground stone artifacts, no ceramics and only one organic artifact were recovered from the Northeast Point site. The latter is the midsection of a beaver incisor, split longitudinally and slightly modified on the lingual surface, resembling some of the incisor tools from the Camp site.

The radiocarbon date and the artifact assemblage from this site suggest cultural and temporal affinities between the Northeast Point site, the Camp site and Weir site stratigraphic component 4. However, the high density of flaked stone artifacts, the absence of ground stone and ceramics, and the differences in site structure and location, suggest that the Northeast Point site was functionally different from the shell middens. Without faunal remains and a clear understanding of the functions of the bifaces and scrapers in the assemblage, the nature of this difference is difficult to postulate. I interpret the Northeast Point site as representing a relatively short single component occupation.

The Lighthouse Cove site:

Lithics from this site include 6 flakes of green chert (Plate 5-17, d-e). One of these is a large retouched flake bleached over most of its surface; the other is a slightly bleached flake with some trampling damage on one margin. Three of the remaining flakes have areas of highly polished pebble cortex on their dorsal surfaces, similar to some of the green chert flakes from the Camp site.

Ceramics include 2 shell tempered body sherds that fit together (Plate 5-17, f). The ceramics suggest temporal and cultural affinities between the Lighthouse Cove site and Weir site stratigraphic component 4. No organic artifacts were recovered from Lighthouse Cove.

The Pintlowes Cove site:

Lithics from this site include 2 flakes of green chert (Plate 5-17, a-b), and half of a split quartzite pebble (Black 1988e:116, 127). There are no indications of retouch or use wear on the chert flakes, and neither is cortical; the morphology of one suggests a biface thinning flake. No ceramics were recovered from

PLATE 5-17: Artifacts and debitage from the Pintlowes Cove (a-c) and Lighthouse Cove (d-f) sites: a = flake (green chert); b = flake (green chert); c = modified beaver incisor; d = retouched flake (bleached green chert); e = flakes (green chert); f = shell tempered ceramic sherds.

****
LIVING CLOSE TO THE LEDGE

d
e
f
Scale cm

this site. The assemblage does contain one organic artifact, a fragmentary midsection of a modified beaver incisor (Plate 5-17, c) similar to those from the Camp and Northeast Point sites. The similarities in contents, location and structure between the Pintlowes Cove site and the Lighthouse Cove site suggest temporal and cultural affinities with the latter site as well.

Cultural history of the Bliss Islands and the insular Quoddy region:

My culture history interpretations of the Bliss islands analytical units are summarized diagrammatically in Figure 5-2. The period from 2500bp to the present is divided into 5 culture historic periods: i) Early Maritime Woodland (pre-2100bp); ii) Middle Maritime Woodland (ca. 2100bp - ca. 1550bp); iii) Late Maritime Woodland (ca. 1550bp - ca. 550bp); iv) protohistoric (ca. 550bp - ca. 350bp); and v) historic (ca. 350bp to the present). Each of the Bliss Islands sites is represented by a column labelled at the top of the diagram. The columns consist of areas of dense stippling, coarse stippling and blank areas; dense stippling indicates good evidence for occupation (including radiocarbon dates, stratified contexts, and/or diagnostic artifacts), coarse stippling indicates more tenuous evidence for occupation, and blank areas indicate no evidence for occupation.

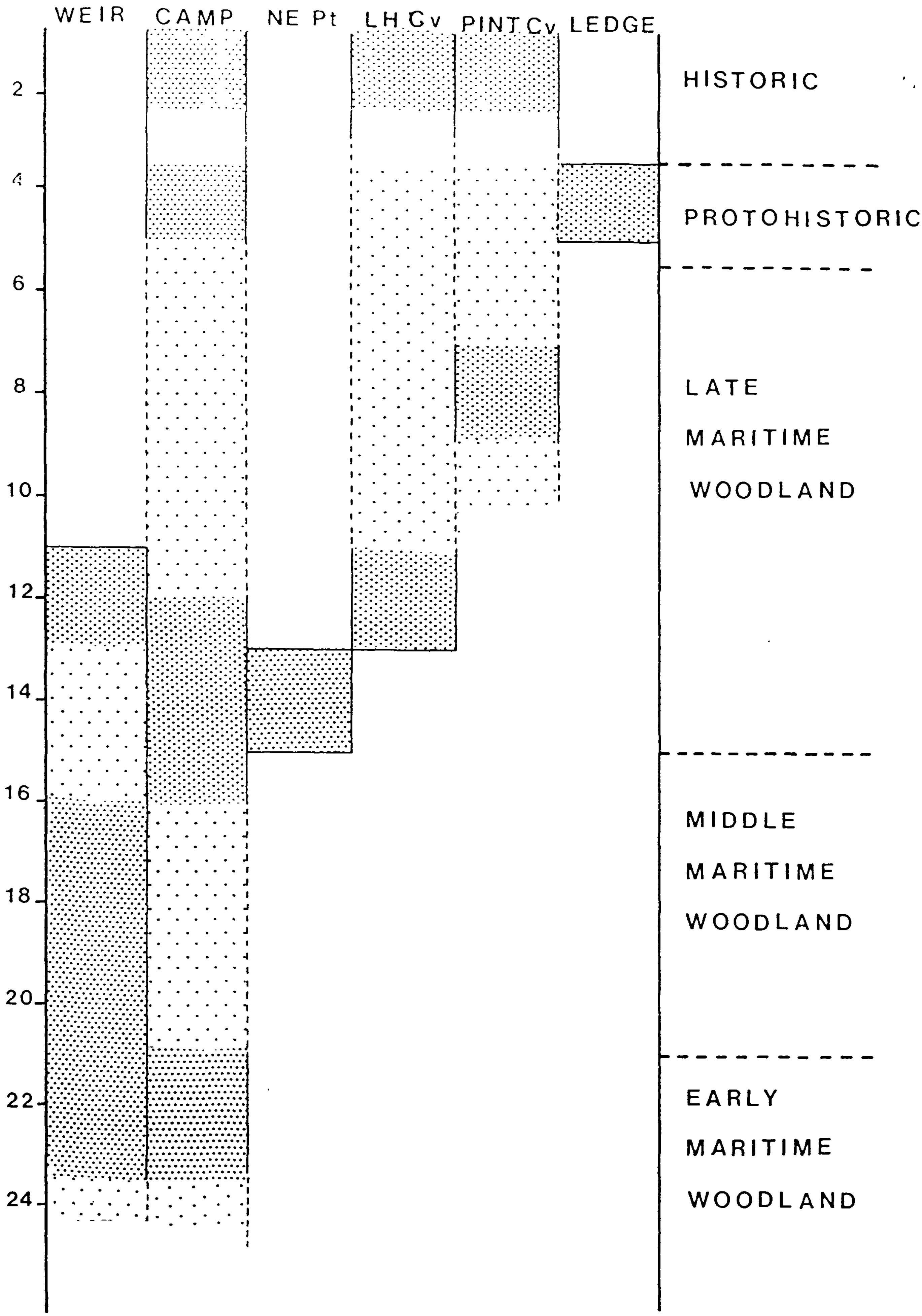
There is good evidence for at least sporadic occupation of the islands during all of the culture historic periods designated.

In general, the evidence from the Weir site indicates occupations from the Early Maritime Woodland through the Late Maritime Woodland periods, while most of the evidence from the Camp site indicates occupations during the Late Maritime Woodland and historic periods. However, these apparent differences may result from the areas selected for excavation at the sites. There is evidence that much of the midden material on the north side of the Weir site may date to the Late Maritime Woodland period (Black 1985a), and further excavation at the Camp site may reveal more evidence for Early and Middle Maritime Woodland occupations. I suggest that the Camp and Weir sites were occupied periodically, and simultaneously throughout the Maritime Woodland period, but were functionally differentiated; the Camp site was an area where living floors and other structures were built and a wide variety of domestic activities carried out, while the Weir site functioned mainly as an area for gathering and processing marine resources.

The Early and Middle Maritime Woodland artifact assemblages from the Weir site are similar to those from the Partridge Island site. The presence of two large corner notched biface bases at Partridge Island may indicate the types of projectile points used in the Quoddy region during the Middle Maritime Woodland period. The evidence from the Weir site suggests that some reinterpretation of the Partridge Island assemblages is

FIGURE 5-2: Diagrammatic representation of the temporal and cultural relationships between the Bliss Islands analytical units. Dense stippling indicates reliable evidence for occupation; coarse stippling indicates tenuous evidence for occupation; blank areas indicate no occupation.

****
LIVING CLOSE TO THE LEDGE


WEIR
CAMP
NE Pt
LH Cv
PINT Cv
LEDGE
2
4
6
8
10
12
14
16
18
20
22
24
HISTORIC
PROTOHISTORIC
LATE MARITIME WOODLAND
MIDDLE MARITIME WOODLAND
EARLY MARITIME WOODLAND

necessary. The presence of numerous small pieces of lithic debitage, beaver incisor artifacts, and a few sherds of shell tempered cord wrapped stick impressed ceramics in unit 1 and in the topsoil at Partridge Island suggest Late Maritime Woodland material dating to ca. 1550bp and later. Late Maritime Woodland artifacts are apparently not well represented in the excavated parts of Partridge Island, and were not recognised as a separate component in previous discussions of the site (e.g. Bishop and Black 1988).

Two assemblages of shoreline collected artifacts from Deer Island , both apparently eroding from shell-poor or non-shell contexts, indicate that there may be non-shell counterparts to the Early Maritime Woodland and Middle Maritime Woodland shell midden components. A collection from Stuart Town catalogued by Bishop (in 1981) includes a ground stone axe and relatively large straight stemmed and contracting stemmed projectile points. These probably represent Early Maritime Woodland and Middle Maritime Woodland occupations on Deer Island. A large collection of lithic artifacts and debitage from the Richardsonville area (belonging to Ralph Welsh) includes straight stemmed, contracting stemmed and wide side notched projectile points and numerous unfinished bifaces. The density of lithic artifacts and debitage from this area seems much higher than would be expected from shell midden contexts. I suggest that these localities may represent Early and

Middle Maritime Woodland occupations where lithic artifacts were manufactured and used more frequently than in the occupations represented in the shell middens.

Interpretation of the Camp site Late Maritime Woodland component presents a problem with respect to duration of occupation. It could represent a few brief intensive occupations of the site over a short period of time, as Sanger (1987:83-84) has interpreted the largest component at the structurally similar Carson site. On the other hand, it could represent sporadic reoccupation throughout the Late Maritime Woodland, protohistoric and historic periods, as Sheldon (1988:108-111) has interpreted the Brown site in Nova Scotia, which is structurally and temporally similar to Camp and Carson. Similarly, Nash (1986:25-28) interprets the Delorey Island site in Nova Scotia as representing sporadic occupation over a 1000 year time span including the historic period.

From the absence of significant amounts of cord wrapped stick impressed and shell tempered ceramics, I interpret the Camp site Late Maritime Woodland component as dating to the earlier part of that period, and from the presence of a number of living floor features, I interpret this component as representing several reoccupations of the site, probably relatively close together in time. The Northeast Point site may represent a specialized assemblage contemporaneous with the Camp site Late Maritime Woodland material. Weir site stratigraphic component 4 represents somewhat later Late Maritime Woodland occupation(s), when, in contrast to the settlement pattern inferred for the earlier periods, a habitation area was established on the surface of the shoreward mound at Weir, and a marine resource processing area on the northern mound at the site.

I interpret the prehistoric material from the Lighthouse Cove site as representing a Late Maritime Woodland occupation because: i) structurally the site is similar to the Camp site and Weir site stratigraphic component 4; ii) the lithics resemble some from the Camp site; and iii) the ceramics resemble the shell tempered sherds from Weir site stratigraphic component 4. The site probably dates ca. 1200bp-1000bp.

I interpret the prehistoric material from the Pintlowes Cove site as representing a Late Maritime Woodland occupation because: i) it is structurally similar to the Camp site and Weir site stratigraphic component 4; ii) the lithics are similar to some of those from the Camp site; and iii) the beaver incisor artifact is similar to those from the Camp and Northeast Point sites, and Weir stratigraphic component 4. The absence of ceramics suggests it may date significantly later than the other Late Maritime Woodland components on the islands. However, the absence of ceramics may also result from sampling bias or differences in site function. I have postulated an age in the earlier part of the Late Maritime Woodland period because of the structural similarities between

****
LIVING CLOSE TO THE LEDGE

Pintlowes Cove and Lighthouse Cove sites and their proximity to one another.

These interpretations leave a gap in the cultural history of the Bliss Islands spanning the period from ca. 1000bp to ca. 500bp. However, there is evidence of occupation elsewhere in the insular Quoddy region during this period. The Gooseberry Point site contains an artifact assemblage that, in many ways, resembles those from the Northeast Point and Camp sites, and Weir stratigraphic component 4. Lithic artifacts include hammerstones, small lithic scrapers, and utilized flakes, as well as large stone choppers and flaked knives. Organic tools include incisors, awls, harpoon tips and modified carnivore canines (Turnbull 1981). I suggest that this site should be interpreted as Late Maritime Woodland; it indicates that Late Maritime Woodland assemblages occur at least as late as ca. 600bp in the Quoddy region. Also present at Gooseberry Point are a few sherds of thin coiled pottery similar to the late prehistoric ceramics described by McManamon (1984) from Cape Cod (Black and Johnston 1986).

A number of sites in the Maritimes suggest that while ceramic technology changed from grit to shell temper and eventually was discontinued in the region, Late Maritime Woodland lithic assemblages persisted until the protohistoric period. Evidence from Nova Scotia suggests a time span for Late Maritime Woodland lithic assemblages similar to that detected in the insular Quoddy region, that is from ca. 1500bp to ca. 450bp (Sheldon 1988:135-

145). Another common theme in assemblages throughout the Maine/Maritimes during this time period is the large numbers of incisor artifacts (e.g. Bishop 1983a; Sanger and Chase 1984; Stewart 1986:135; Spiess et al. 1983).

The protohistoric and early historic periods are problematic parts of this formulation of Bliss Islands culture history. The evidence for protohistoric occupation is based mainly on radiocarbon dating and site structure. From the radiocarbon date, I interpret the Ledge site as representing a protohistoric occupation. It may equate in time with the suspected protohistoric occupation at the Camp site. If ceramics ceased to be a part of the cultural inventory in the Quoddy region by the protohistoric period, but lithic assemblages remained similar throughout the Late Maritime Woodland, some of the lithic material at Camp may date to the protohistoric period. Perhaps, at this time, Camp again functioned as a habitation site, while the Ledge site functioned as a marine exploitation and processing site.

At present, there is no archaeological evidence for occupation of the islands by Euro-Americans prior to the Loyalist occupations beginning in AD1783. There is both documentary and archaeological evidence for occupation from the Loyalist period through to the present.

****
LIVING CLOSE TO THE LEDGE

Notes:

1. Cryptocrystalline quartz is referred to throughout the remainder of this chapter by the generic term 'chert'. This category includes materials that have been referred to in other Maritimes archaeological reports as jasper, agate, chalcedony, chert and felsite. For analytical purposes, the chert category is divided into three colour groups: red, brown, and green.

2. Crotts (1984:38-59) defines exotic lithics as those whose lithology indicates that they did not come from bedrocks in the Quoddy region. Some of the exotic lithics may be present in the region as a result of glacial transport (Crotts 1984:56). Thus, 'exotic' lithics cannot necessarily be interpreted as an indication of cultural transport or trade. However, some of the exotic lithics, such as the red and yellow-brown coloured cherts associated with the Late Maritime Woodland occupations at Camp, Weir, and Northeast Point, which may come from the Scott's Bay area of Nova Scotia (Deal 1988:p.c.), do definitely indicate cultural transport and/or trade.

3. The organic artifacts from the Bliss Islands are being studied by Kevin Robins (St. Mary's University). As a result, most were unavailable for illustration in this chapter. Preliminary descriptions and distributions of the organic artifacts are presented in Robins and Black (1988).

4. Note that there is an error in the caption for Sanger's (1986:146) Plate 2: d-f; it should read 'Early and Middle Ceramic Period' (Sanger 1986:p.c.).

5. Shell tempered ceramics do not completely replace grit tempered ceramics until ca. 700bp in the Maine/Maritimes area (Davis 1988; Deal 1988).

Blank page inserted to maintain continuity.

CHAPTER 6:

SUBSISTENCE PATTERNS OF THE BLISS ISLANDS SITES.

> "The key to the understanding of any society lies in the observation and analysis of the insignificant and the mundane" (David Bradley in The Chaneysville Incident).

In this chapter the faunal assemblages and other subsistence information from the Bliss Islands sites are described and discussed. This information is used to address two issues: i) similarities and differences between the analytical units defined in chapter 3; and ii) prehistoric subsistence practices on the Bliss Islands.

Presentation of the faunal data:

The faunal data from the Bliss Islands are presented in a series of tables in Appendix D. Table D-1 is a master list showing the taxonomy of animal species identified in the faunal assemblages. Table D-2 shows the distribution of vertebrate zoological classes by analytical units, and the density of vertebrate remains in each unit. Three vertebrate zoological classes have been identified: Mammalia (mammals), Aves (birds), and Osteichthyes (bony fishes).1 Tables D-3, D-4, and D-5 show the distributions of mammal species, avian species, and fish species, respectively, by indicating the minimum number of individuals (MNI) for each species in each analytical unit.

Table D-7 shows the distribution of invertebrate species by presenting the inferred total weight of shell from each species. These amounts were calculated by extrapolating the proportions of various invertebrate species in column samples of known volume to the total volume of shell excavated from each analytical unit.

Bliss Islands faunal assemblages:

Weir site

A total of 9544 pieces of bone were recovered from the Weir site; of these, 22.7% are mammal, 1.7% are bird, and 75.6% are fish.2 The overall density of vertebrate remains in the site is 0.76pc per lt.

Figure 6-1 shows the proportions of mammal, bird and fish bones in each of the Weir site analytical units. In comparison to the other Bliss Islands sites, the Weir site contains a high proportion of fish remains, a moderate proportion of mammal remains, and a low proportion of bird remains. Stratigraphic components 1, 2 and 3 reflect the pattern for the site as a whole, although stratigraphic component 2 has higher proportions of mammal and bird remains and a lower proportion of fish remains, than stratigraphic components 1 and 3. Stratigraphic component 4 has a much higher proportion of mammal and avian remains, and a much lower proportion of fish remains than the other three stratigraphic components.

Table 6-1 reports statistical tests on the Weir site faunal data. The first test compares all four of the stratigraphic components to one another. The remaining 6 tests compare each pair of assemblages. The sample sizes are adequate for all of the tests except the last (#7). Stratigraphic components 1 and 2 do not contain large enough samples of small fish bones to allow a valid chisquare test; thus, the fish data in this case were compressed into a single category. The chisquare tests in Table 6 indicate that each stratigraphic component in the Weir site is significantly different from each other stratigraphic component in terms of vertebrate piece counts.

Figure 6-2 shows the distinctiveness of the Weir site stratigraphic components in terms of the faunal assemblages recovered from them. There is some overlap among the stratigraphic components, but each is relatively distinctive. The samples from stratigraphic component 3 have a bimodal distribution: while most cluster toward the lower left corner of the graph (high mammal, low fish), a number of samples cluster in the lower right corner (low mammal, high fish). This may indicate two types of occupations in this component. Even when the variability is taken into account, the stratigraphic (and temporal) trend from assemblages containing high proportions of

FIGURE 6-1: Proportions of vertebrate zoological classes in the Weir site faunal assemblages.

****
LIVING CLOSE TO THE LEDGE

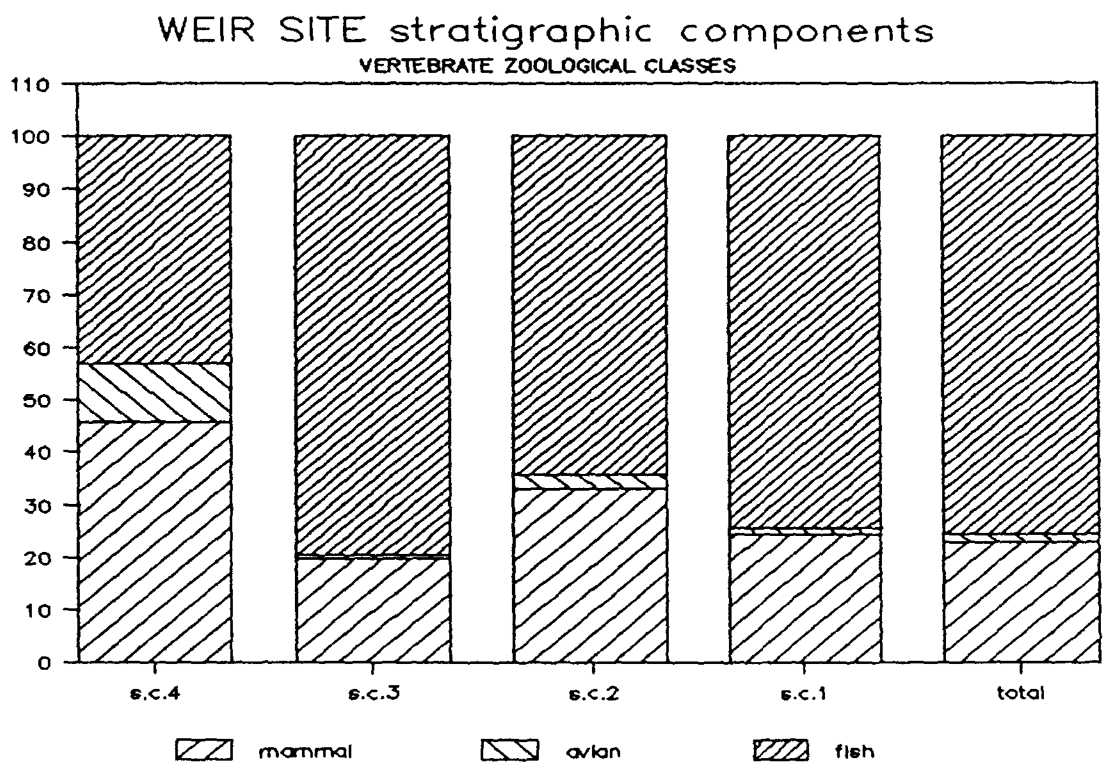
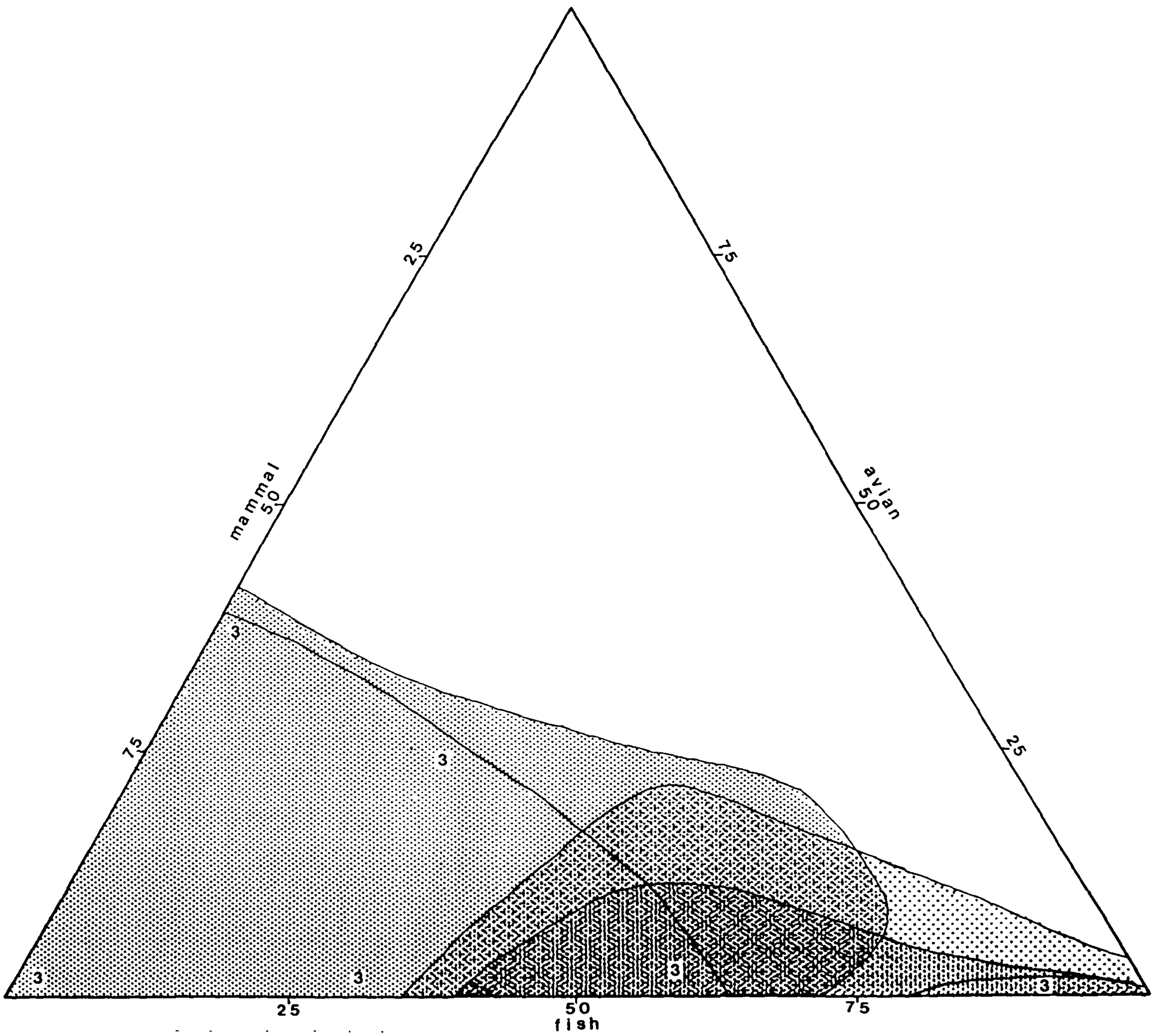

WEIR SITE stratigraphic components
VERTEBRATE ZOOLOGICAL CLASSES
110
100
90
80
70
60
50
40
30
20
10
0
s.c.4
s.c.3
s.c.2
s.c.1
total
mammal
avian
fish

FIGURE 6-2: Triangular co-ordinate graph showing the distribution and variability of Weir site vertebrate zoological classes. The relative proportions of the three zoological classes were calculated for the provenience units in each analytical unit, each provenience unit was plotted and the distribution of provenience units representing each analytical unit was stippled. Only provenience units with good stratigraphic context, and from which more than 3 pieces of bone were recovered, were plotted. The stippling patterns correspond to those shown in Figures A-5 and A-6.



25
50
mammal
75
75
50
avian
25
3
3
3
3
3
3
3
25
50
75
fish

TABLE 6-1: Chisquare tests comparing the Weir site faunal assemblages.

1)

null hypothesis: There is no significant difference among the faunal assemblages from the Weir site stratigraphic components.
degrees of freedom: 9.00
alpha-risk: 0.05
chisquare value: 4055.67
critical value: 16.9
results: null hypothesis rejected
comments: 1 cell with expected counts of less than 5

2)

null hypothesis: There is no significant difference between the faunal assemblages from stratigraphic components 3 and 4.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 981.95
critical value: 7.81
results: null hypothesis rejected
comments:

3)

null hypothesis: There is no significant difference between the faunal assemblages from stratigraphic components 2 and 4.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 339.24
critical value: 7.81
results: null hypothesis rejected
comments:

4)

null hypothesis: There is no significant difference between the faunal assemblages from stratigraphic components 1 and 4.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 211.52
critical value: 7.81
results: null hypothesis rejected
comments:

5)

null hypothesis: There is no significant difference the faunal assemblages from strati components 2 and 3.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 2831.77
critical value: 7.81
results: null hypothesis rejected
comments:

6)

null hypothesis: There is no significant difference the faunal assemblages from strati components 1 and 3.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 1512.11
critical value: 7.81
results: null hypothesis rejected
comments:

7)

null hypothesis: There is no significant difference the faunal assemblages from strati components 1 and 2.
degrees of freedom: 2.00
alpha-risk: 0.05
chisquare value: 10.3
critical value: 5.99
results: null hypothesis rejected
comments: data compressed

****

LIVING CLOSE TO THE LEDGE

fish remains, to assemblages containing high proportions of mammal remains and significant proportions of avian remains, can be discerned.

Brief descriptions of the faunal assemblages from each of the stratigraphic components follow. These remains are spatially clustered into groups representing particular zoological classes and faunal individuals. This point underlines, again, the remarkable structural integrity of the site.

Stratigraphic component 1

The vertebrate faunal assemblage from this stratigraphic component consists of 258 pieces; of these, 24.4% are mammal, 1.2% are bird, and 74.4% are fish. The density of faunal remains is 0.34pc per lt.

Most of the bones have suffered some surface erosion; a significant number are severely eroded, and ca. 25.0% show some evidence of root etching. Only one piece of calcined bone has been identified in this assemblage, and there is no evidence that any of the bones were gnawed by canids.

Mammal remains include those of at least 1 beaver (one artifactual incisor), 1 dog (the complete pelvic girdle), 1 bear (the left mandible) and 1 moose (a distal phalanx). There are no identifiable bird remains. Most of the fish remains represent large cod fish, including at least 2 Atlantic cod; all parts of the fish skeletons are represented, but cranial and vertebral elements are most common because of the recovery and identification techniques used. Only 1 piece of small fish bone (a vertebra, probably from a small cod fish) was found in this component. In addition, 2 pieces of dermal scutes from an Atlantic sturgeon were recovered.

There are relatively few invertebrate remains definitely associated with stratigraphic component 1. Most of those recovered from the black soil horizon itself are probably intrusive from shell layers assigned to stratigraphic component 2 (they consist of sea urchin shell and fine clam fragments adhering to the surface of the soil). However, there are pieces of shellfish periostrachum preserved in the black soil deposit, and at least two small lenses of shell, consisting mainly of soft-shelled clams and sea urchins, are stratigraphically below the black soil. The clams in these lenses appear less well preserved and more weathered than clams in the layers above. I interpret these lenses as either pre-dating the formation of the black soil deposit, or as being the same age as the cultural occupations which occurred on the soil layer.

stratigraphic component 2

The vertebrate faunal assemblage from this component consists of 864 pieces, of which 32.9% are mammal, 3.0% are bird and 64.1% are fish. The density of bones is 0.29pc per lt.

There are no burned bones in the assemblage, and only a small number (2.0%) indicate gnawing by canids. Ca. 30.0% of the bones bear evidence of root etching, and varying degrees of surface erosion are present. All of these taphonomic indicators are more common on the living floors than in the shell midden deposits.

The vertebrate remains include those of at least 1 beaver (an artifactual incisor), and 1 deer, represented mainly by cranial fragments and teeth, and some cervid extremity bone pieces possibly belonging to the same individual. A whale vertebra, probably from a juvenile individual of a small whale species, is also present; this bone, as discussed in the previous chapter, was probably brought on site to form part of a structure rather than as a subsistence remain.

Only one bird can be identified, a duck represented by a highly fragmented sternum. The fish remains include those of at least 1 Atlantic cod, 3 harbour pollock, and a 4th large cod-like fish (species unidentified). Two small fish vertebrae, probably from small cod fish, were recovered. In addition, the assemblage contains the premaxilla of a large monkfish.

Shellfish remains in this component are predominated by soft-shelled clams and sea urchins. Also present are significant amounts of horse mussels and dogwhelks, and smaller amounts of common mussels and northern whelks. Several small lenses of shell immediately above stratigraphic component 1 contain very high proportions of sea urchin shell in comparison to other layers in the site. The upper layers in stratigraphic component 2 contain proportionally more clam shells. The invertebrate remains are well preserved and are not highly fragmented.

stratigraphic component 3

The vertebrate faunal assemblage from this component consists of 7829 pieces of bone, of which 19.8% are mammal, 0.8% are bird and 79.4% are fish. The density of bone pieces is 1.28pc per lt. This figure is inflated by the presence of a few clusters of small fish bones; the density of bone pieces, excluding small fish bones, is 0.38pc per lt, a figure similar to the densities of faunal remains in stratigraphic components 1 and 2.

Many of the bones in this assemblage exhibit minor to moderate surface erosion; ca. 30.0% of the bones exhibit root etching, and 3.0% of the pieces have been burned. Eroded, root etched and burned bones are all more common on the living floors than in the shell midden deposits. Ca. 12.0% of the bones exhibit evidence of canid gnawing; however, in contrast to the other types of destruction noted, canid chewed bones are much more common in the midden deposits than on the floors.

The mammal remains include those of at least 1 squirrel, 2 voles, 3 muskrats, 1 porcupine, 1 marten and 1 otter; all of these are represented by mandibles and/or incisor teeth only. At least 4 beaver individuals are present, but only 1 of these is

****
LIVING CLOSE TO THE LEDGE

represented by post-cranial bones; the others are represented by artifactual incisor teeth. At least 1 dog, 1 harbour seal and 1 grey seal are present; each of these individuals is represented by bones from all parts of the skeleton. Virtually the entire skeleton of the grey seal is present. At least 1 caribou and 2 deer are represented by extremity bones only. Finally, the only human remain identified from the Bliss Islands, an adult mandible lacking teeth, was recovered from a midden deposit in this component.

Bird remains include at least 6 individuals: 1 grouse, 1 gull, 1 small shorebird, 2 ducks and 1 goose. Each of these birds is represented mainly by extremity bones.

Fish remains include at least 4 small herring-like fish and 4 small cod-like fish; all parts of the small fish skeletons are represented. These remains occur in shell deposits as small dense clusters also containing occasional small eroded fragments of mammal bone. These clusters may represent coprolites of either humans or of some other animal (perhaps domestic dogs).

One long-horned sculpin is present, represented by a relatively complete skeleton found as a single cluster of bones. At least 3 large cod are present, 1 Atlantic cod, 1 pollock and 1 other cod fish. In addition, 1 other large fish (family unidentified) is represented by a dentary.

Shell midden layers in this component are of two types: most of the layers are predominantly soft-shelled clams and sea urchins, but some are predominated by soft-shelled clams and horse mussels. Significant amounts of common mussels, dogwhelks and northern whelks are also present. Limpets, bean mussels, saxicaves and barnacles occur in trace amounts. The shell remains are well preserved and are not highly fragmented. Even some of the relatively fragile mussel valves are complete, and articulated portions of sea urchin tests are present in some layers.

stratigraphic component 4

The vertebrate faunal assemblage from this component consists of 593 pieces of bone, of which 45.7% are mammal, 11.3% are bird and 43.0% are fish. The bones occur at a density of 0.21pc per lt, the lowest density in the site by ca. 0.10pc per lt.

There has been considerable erosion of bone surfaces in this component, and ca. 25.0% of the pieces bear evidence of root etching. Ca. 2.0% of the bones have been chewed by canids. There seems to be little difference between floor and midden deposits in terms of bone preservation, probably because the shell layers are shallow, and the entire component was exposed to weathering for a considerable period of time before being buried by peat.

Ca. 8.0% of the assemblage is burned or calcined. This is probably an underestimation of the actual amount of burned bone in the component, since the column samples examined from it produced many small pieces of calcined bone; these were indistinguishable from shell fragments during routine excavation. The increased amounts of burned faunal remains may indicate either differences in subsistence and food preparation practices from the earlier components, or the effects of slash and burn clearing of the site surface.

The most common mammal remains in this assemblage are those of beaver, and most pieces are cranial or dental; at least 2 beaver are present, only 1 of which is represented by post-cranial skeletal material. Also present are the mandible of 1 vole, cranial and mandibular portions of 1 dog, cranial portions of 1 harbour seal, and 1 moose represented by a single metatarsal. There are also two pieces of whale bone present, portions of a sternum and a rib of an unidentified large whale species. These are considered to be structural remains rather than faunal remains: the sternum was incorporated with several rocks into a feature, and the rib appears to have been inserted vertically into the site surface, possibly functioning as a stake.

Birds in this assemblage include at least 2 ducks, 1 gull, 1 great auk, 1 murre, 1 passenger pigeon, and 1 owl; all of these birds are identified from extremity bones, and all are considered to be associated with the prehistoric occupation. One unidentified bird, represented by a cranium, is considered to be intrusive. The fish remains represent at least 1 large Atlantic cod and 1 small cod-like fish.

Shellfish remains in this component are predominated by soft-shelled clams and sea urchins, although small amounts of horse mussels, common mussels, dogwhelks, northern whelks, limpets and barnacles are also present. The shells occur in small relatively small layers and lenses, and are more weathered and more fragmented than in stratigraphic components 2 and 3. Several patches of burned shell were noted during the excavation.

<u>Camp site</u>

A total of 3193 pieces of bone were recovered from the Camp site; of these 47.8% are mammal, 12.9% are bird and 39.3% are fish. The density of vertebrate remains is 0.33pc per lt.

Figure 6-3 shows the proportions of mammal, bird and fish bones in each of the Camp site analytical units; the upper graph shows the layer assemblages, and the lower graph the area assemblages. This site contains higher proportions of mammal and bird bones, and lower proportions of fish bones, than the Weir site. Layers 2 and 3, which yielded ca. 90% of the bones, contain very similar assemblages reflecting the pattern for the site as a whole. In contrast, layers 1 and 4 contain much higher proportions of mammal bones and much lower proportions of fish bones.

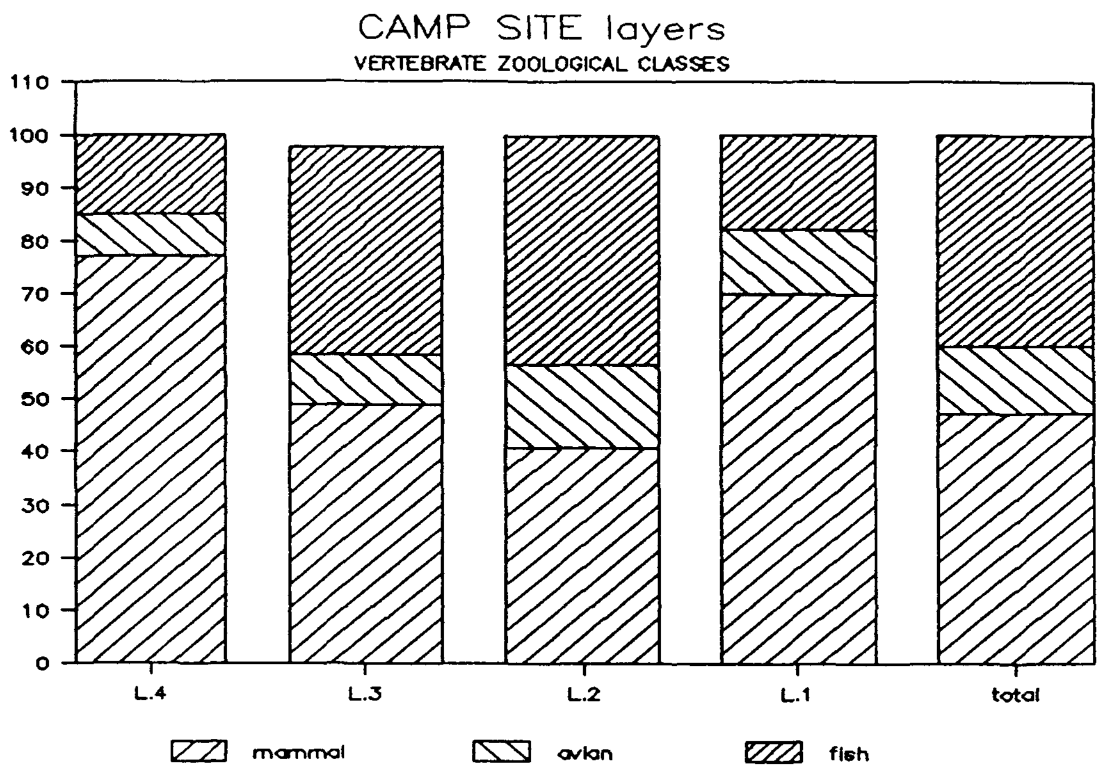
Figure 6-4 shows the variability in zoological classes in the

Camp site layers. The distributions overlap one another almost completely; layers 2 and 3 have virtually identical distributions.

There are surprisingly few studies of the effects of pedogenic processes on the archaeological record in general, and on distributions of archaeological remains within sites in particular (Wildesen 1982:58-60). However, the distribution of vertebrate faunal remains in the Camp site is what might be expected if all of the bones were deposited on a single surface (ie. the living floors in layer 2, which have very high bone densities), and were then slowly incorporated into a developing soil horizon (e.g. Van Noten et al. 1980). In this scenario, the bones in layers 1, 3 and 4 would all be intrusive from layer 2.

This cannot be completely true because the historic bones, at least, must have been added later than those associated with the prehistoric features. Common periwinkle shells found in unit 83:2 (Black 1985a:37) indicate that some of the invertebrate remains at the site are also historic (Black 1983:266; Clarke 1971). This situation is further complicated by the difficulty in establishing contemporaneity between the floors and the shell deposits, as discussed previously. However, the evidence does suggest that most of the Camp site faunal assemblage results from a relatively short span of occupation, and largely belongs to a single cultural component (Black, Gruspier and Johnston 1988). The artifactual evidence presented in the previous chapter

FIGURE 6-3: Proportions of vertebrate zoological classes in the Camp site layers and areas.


CAMP SITE layers
VERTEBRATE ZOOLOGICAL CLASSES
110
100
90
80
70
60
50
40
30
20
10
0
L.4
L.3
L.2
L.1
total
mammal
avian
fish

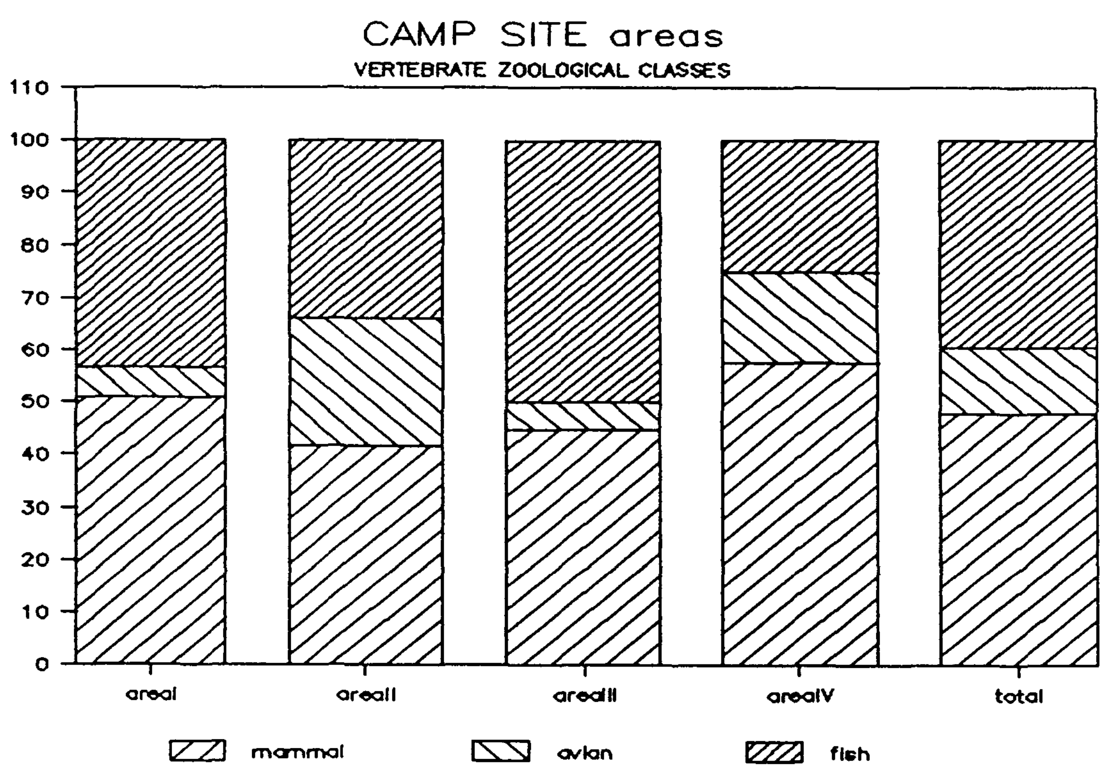
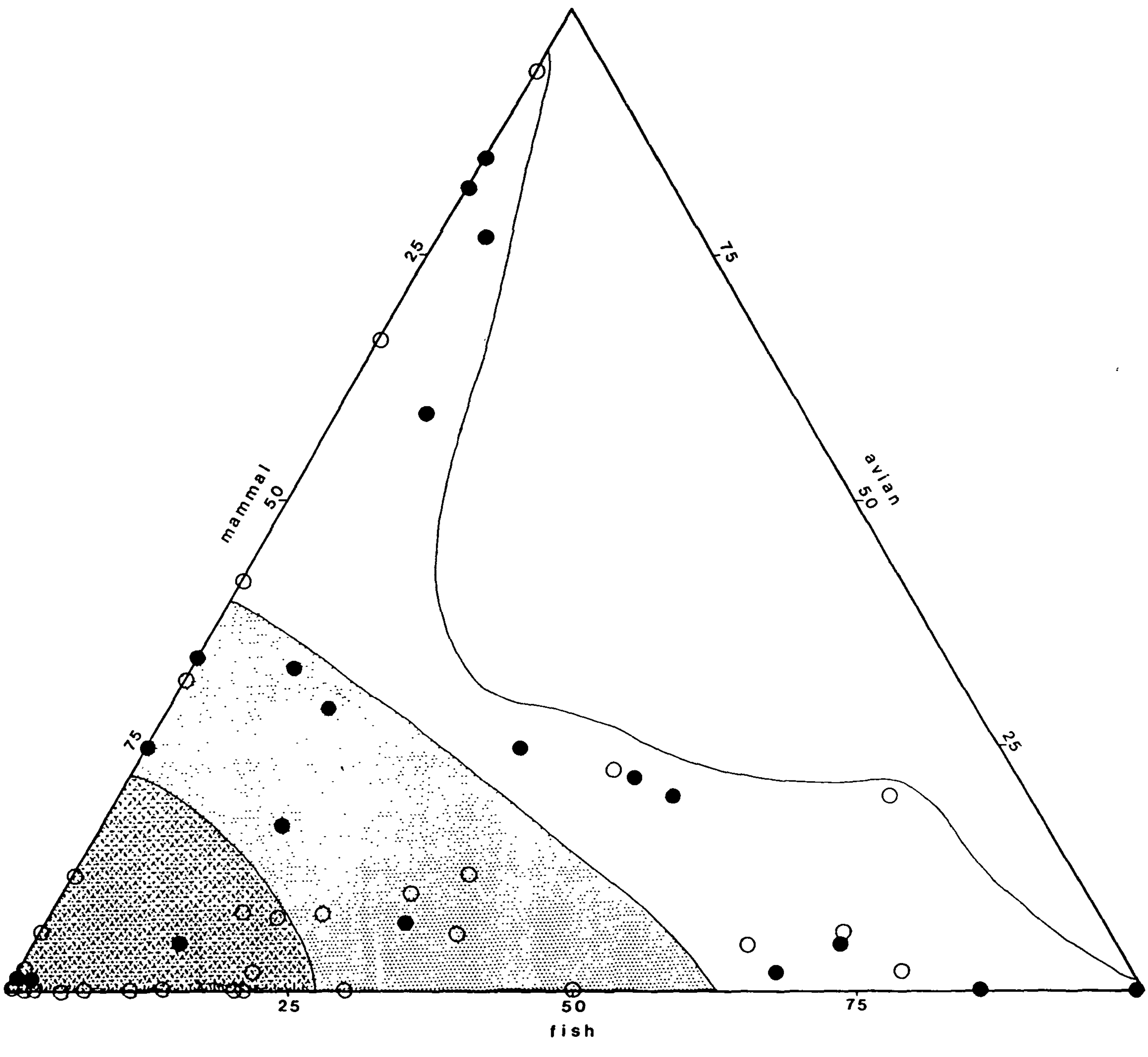

CAMP SITE areas
VERTEBRATE ZOOLOGICAL CLASSES
110
100
90
80
70
60
50
40
30
20
10
0
areaI
areaII
areaIII
areaIV
total
mammal
avian
fish

FIGURE 6-4: Triangular co-ordinate graph showing the distribution and variability of Camp site vertebrate zoological classes by layers. The relative proportions of the three zoological classes were calculated for the provenience units in each analytical unit, each provenience unit was plotted and the distribution of provenience units representing each analytical unit was stippled. Only provenience units with good stratigraphic context, and from which more than 3 pieces of bone were recovered, were plotted. Stippling patterns correspond to those shown in Figures A-10 and A-11. Open points indicate samples from layer 3; filled points indicate samples from layer 2.



25
50
mammal
75
75
50
avian
25
25
50
75
fish

indicates that this was the Late Maritime Woodland component.

In spite of the potential homogenizing effects of pedogenesis and historic disturbances, the Camp site faunal assemblage appears to have retained considerable structural integrity and spatial differentiation. Chisquare tests comparing subassemblages by layer and area are presented in Table 6-2. There are significant differences between all of the groups of subassemblages compared, with one exception: there is no significant difference between the layer assemblages in area I.

Areas I and III on the west side of the excavation block contain most of the fish bones; areas II and IV on the east side contain most of the bird bones (Figure 6-3). Domestic animals are all associated with layers 3 and 4, especially layer 4. Beaver elements are predominantly associated with areas I and III. Skeletal elements from a single moose individual are widely distributed in areas I, II, and IV, but are almost all associated with the shell deposits in layer 3. Sometimes, elements belonging to the same inferred faunal individuals were recovered from living floor contexts and adjacent overlying shell deposits. Unfortunately, these distributional patterns are of little use in choosing between the two possible depositional sequences postulated for the site.

Bones are less well preserved in the Camp site than in the Weir site. Only ca. 0.5% are burned, but most have suffered some

TABLE 6-2: Chisquare tests comparing the Camp site faunal assemblages.

1)
null hypothesis: There is no significant difference among the faunal assemblages from the four areas of the Camp site.
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 274.90
critical value: 12.60
results: null hypothesis rejected
comments:

2)
null hypothesis: There is no significant difference among the faunal assemblages from the four layers of the Camp site.
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 128.09
critical value: 12.60
results: null hypothesis rejected
comments:

3)
null hypothesis: There is no significant difference between the faunal assemblages from Camp site layers 2 and 3.
degrees of freedom: 2.00
alpha-risk: 0.05
chisquare value: 34.11
critical value: 5.99
results: null hypothesis rejected
comments:

4)
null hypothesis: There is no significant difference among the faunal assemblages from the layers in Camp site area I.
degrees of freedom: 2.00
alpha-risk: 0.05
chisquare value: 0.36
critical value: 5.99
results: null hypothesis retained
comments: data compressed

5)
null hypothesis: There is no significant difference among the faunal assemblages from the layers i Camp site area II.
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 112.16
critical value: 12.60
results: null hypothesis rejected
comments: 3 cells with expected counts of less tha

6)
null hypothesis: There is no significant difference among the faunal assemblages from the layers i Camp site area III.
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 76.60
critical value: 12.60
results: null hypothesis rejected
comments: 2 cells with expected counts of less tha

7)
null hypothesis: There is no significant difference among the faunal assemblages from the layers i Camp site area IV.
degrees of freedom: 6.00
alpha-risk: 0.05
chisquare value: 130.16
critical value: 12.60
results: null hypothesis rejected
comments:

surface erosion and root etching. Many have also been chewed by canids, probably indicating the activity of domestic dogs at the site (Gruspier 1987).

Brief descriptions of the Camp site faunal assemblages by layer are presented below. For this study, inferred faunal individuals were assigned to the layer from which most identified elements for that individual came.

layer 1

This layer contains 209 pieces of bone of which 69.9% are mammal, 12.4% are bird and 17.7% are fish. The density of vertebrate remains is 0.52pc per lt. The only vertebrate faunal individual associated with this layer is a beaver, represented by an artifactual incisor. Traces of fragmented clam shell, probably intrusive from layer 3 above, are also present.

layer 2

The vertebrate faunal assemblage from layer 2 consists of 1603 pieces of bone; of these, 41.0% are mammal, 15.8% are bird, and 41.3% are fish. The density of vertebrate remains is 0.65pc per lt.

Mammal individuals associated with this layer include at least 1 beaver (an artifactual incisor), 1 muskrat (an incisor), 1 harbour seal (extremity bones), 1 juvenile domestic dog (cranial and post-cranial elements), 1 black bear (left and right radii), and 1 white-tailed deer (cranial and post-cranial elements). Birds include at least 1 heron, 1 common merganser, 1 hooded merganser, 1 common eider, 1 Canada goose, 1 common murre and 1 crow. All of the birds are identified from extremity bones except the Canada goose, which is represented by a single cranial element. Fish include at least 2 small herring-like fish (2 clusters of vertebrae), 1 sculpin (a pre-opercular spine), 1 Atlantic cod and 1 hake. The cod and hake are represented by cranial and post-cranial elements.

Relatively small amounts of shell (mostly fragmented soft-shelled clams) are present. Some of this shell may be associated with the floors, but most is probably intrusive from layer 3.

layer 3

This layer contains 1223 pieces of bone, of which 49.2% are mammal, 9.2% are bird and 39.3% are fish. The density of vertebrate remains is 0.32pc per lt.

Mammal individuals associated with layer 3 include at least 3 beavers (2 represented by artifactual incisors only, and 1 by post-cranial elements as well), 1 porcupine (a mandible), 1 harbour porpoise (an occipital condyle), 1 subadult domestic dog (cranial and post-cranial elements), 1 marten (a right calcaneum), 1 moose and 1 caribou. The cervids are each represented by a number of post-cranial elements.

Bird individuals include at least 1 red-breasted merganser, 1 goldeneye, 1 black duck, 1 great auk, 1 bald eagle, 1 ruffed grouse, and 1 spruce grouse. All of the birds are identified from extremity bones.

Fish individuals include at least 1 Atlantic cod, 1 harbour pollock and 1 haddock. The fish are represented mainly by cranial elements.

The bulk of the shellfish are associated with this layer. Most of the shell is broken and fragmented soft-shelled clams. Patches of horse mussel and sea urchin, and traces of common mussel, whelks, and barnacles are also present.

layer 4

The vertebrate faunal assemblage from this layer consists of 101 pieces of bone; of these, 77.2% are mammal, 7.9% are bird and 14.9% are fish. The density of vertebrate remains is 0.03pc per lt.

Mammal individuals associated with this layer include at least 1 beaver (an artifactual incisor), 1 vole (extremity bones), and 3 domestic animals, a cow, a sheep and a pig (all identified from teeth). The only bird associated with this layer is a pintail duck (a coracoid). No fish individuals are associated with this layer.

Relatively small amounts of shellfish are present. Soft-shelled clams predominate, but occasional patches of sea urchin and common mussel are also present.

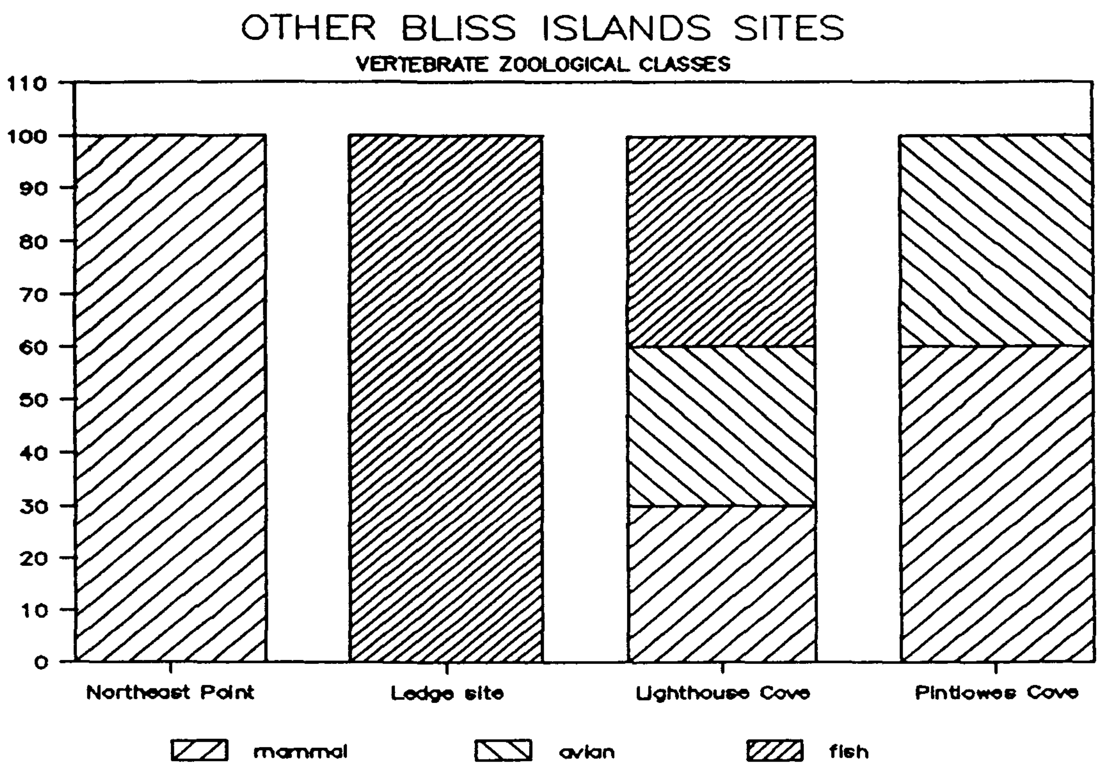
Other sites

The proportions of vertebrate zoological classes in the Northeast Point, Ledge, Lighthouse Cove and Pintlowes Cove sites are shown in Figure 6-5. The sample sizes for Northeast Point and Ledge are too small to make meaningful comparisons with the other analytical units. The Lighthouse Cove and Pintlowes Cove sites contain relatively high proportions of mammal and avian remains and relatively small proportions of fish remains. In this, these two sites most resemble the Camp site and Weir site stratigraphic component 4.

Northeast Point site

The vertebrate faunal assemblage from this site consists of 1 piece of mammal bone, a charred artifactual beaver incisor. The density of bones is low (0.003pc per lt). Traces of burned shell were noted in a matrix sample from one of the living floor deposits, but otherwise invertebrate remains are absent from the site. Other vertebrate faunal remains which may have been present are unlikely to have been preserved unless charred or calcined.

FIGURE 6-5: Proportions of vertebrate zoological classes in the Northeast Point, Ledge, Lighthouse Cove, and Pintlowes Cove sites.



OTHER BLISS ISLANDS SITES
VERTEBRATE ZOOLOGICAL CLASSES
110
100
90
80
70
60
50
40
30
20
10
0
Northeast Point
Ledge site
Lighthouse Cove
Pintlowes Cove
mammal
avian
fish

Thus, this faunal assemblage is not directly comparable to those from the other Bliss Islands analytical units because of differential preservation.

Ledge site

The vertebrate faunal assemblage from this site consists of a single small (possibly cod) fish vertebra found in a matrix sample. The density of bones is very low (0.001pc per lt). The bulk of the faunal assemblage consists of invertebrates, principally soft-shelled clams and sea urchins, although small amounts of horse mussel and other species are present.

Lighthouse Cove site

The vertebrate faunal assemblage from this site consists of 10 pieces, 3 of which are mammal, 3 bird, and 4 fish. The density of bone is 0.02pc per lt. The faunal remains include portions of at least 1 dog (a tooth and some possibly associated extremity bone fragments), 1 large bird, possibly a goose (extremity bone portions), and 1 large cod fish (cranial portions).

Invertebrate remains consist almost exclusively of soft-shelled clams, with only traces of other species present. Common periwinkle shells indicate that at least some of the invertebrate remains result from historic activity.

****
LIVING CLOSE TO THE LEDGE

Pintlowes Cove site

The vertebrate faunal assemblage from this site consists of 5 pieces, 3 of them mammal and 2 bird. The density of vertebrate remains is 0.02pc per lt. All are poorly preserved, being surface eroded, stained and root etched; it is possible that these bones are preserved only because they have been charred. If so, this assemblage may not be directly comparable to the others because of differential preservation.

The assemblage includes the remains of 1 beaver (an artifactual incisor) and 1 duck-size bird (extremity bone). Invertebrate remains are almost exclusively those of soft-shelled clams.

Discussion of the faunal assemblages:

The faunal assemblages from the Bliss Islands analytical units substantiate the differences between Weir site stratigraphic components 1, 2 and 3, and stratigraphic component 4, and the similarities between the latter component and the Camp, Lighthouse Cove and Pintlowes Cove sites postulated in the preceding chapters. Small vertebrate sample sizes make statistical comparisons between the sites difficult. However, the chisquare tests reported in Table 6-3 indicate that although there are significant differences between Weir site stratigraphic component 4 and Camp site layers 2 and 3, there is no significant difference

TABLE 6-3: Inter-site comparisons of Bliss Islands faunal assemblages.

1)

null hypothesis: There is no significant difference between the faunal assmeblages from the Lighthouse Cove site and Weir site stratigraphic component 4.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 6.64
critical value: 7.81
results: null hypothesis retained
comments: 4 cells with expected counts of less than 5

2)

null hypothesis: There is no significant difference between the faunal assmeblages from Weir site stratigraphic component 4 and Camp site layer 3.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 234.54
critical value: 7.81
results: null hypothesis rejected
comments:

3)

null hypothesis: There is no significant difference between the faunal assmeblages from Weir site stratigraphic component 4 and Camp site layer 2.
degrees of freedom: 3.00
alpha-risk: 0.05
chisquare value: 316.22
critical value: 7.81
results: null hypothesis rejected
comments:

between the Lighthouse Cove assemblage and Weir site stratigraphic component 4.

Taphonomic indicators such as root etching substantiate the stratigraphic evidence suggesting that the Weir site was built up over a long period by successive re-occupations. Except in stratigraphic component 4, there is little evidence for periods of non-occupation long enough for surface growth to warrant slash and burn clearing. In contrast, from a faunal perspective, the other sites, especially Ledge, Lighthouse Cove and Pintlowes Cove, appear to represent short-term occupations.

It is possible that shellfish were not harvested at the Camp site until Late Maritime Woodland times. This would account for the shallow stratigraphy and possible non-preservation of bone from the Early and Middle Maritime Woodland occupations. Historic bone has been preserved at the site because of the presence of the shell. The possible protohistoric occupation at the site is enigmatic; it cannot be differentiated from the Late Maritime Woodland occupations. However, the presence of an element from an Atlantic harbour porpoise, a species often mentioned as having been exploited by historic Passamaquoddy, is suggestive. As far as I know, this is the first porpoise element identified from a Quoddy region archaeological site.

The invertebrate faunal assemblages closely reflect local environmental conditions on the Bliss Islands; the surprising aspect of this is just how local this reflection is. The diverse shellfish assemblages from Weir and Ledge reflect the invertebrate fauna available on the rocky shores and ledges adjacent to them. The Camp, Lighthouse Cove and Pintlowes Cove shellfish assemblages reflect the preponderance of soft-shelled clams in the muddy coves adjacent to them. The virtual absence of shellfish from Northeast Point may reflect the virtual absence of easily accessible shellfish resources on that part of the islands. I interpret these observations as indicating that the shellfish in each site were harvested immediately in front of that site, within a radius of 200m or less.

The vertebrate faunal remains, on the other hand, probably reflect regional resource availability. Although this is difficult to determine archaeologically, some of the terrestrial animals may have been brought from other islands or the mainland. In particular, it is probable that beaver and porcupine were brought from the mainland, since neither presently inhabit the islands.

Finally, it is noteworthy that the whale bones from the Weir site are the first identified from a Quoddy region archaeological site. I have interpreted these as structural rather than subsistence remains, because of the contexts in which they were found. The open seaward exposure of the islands make them a likely place for whale carcasses to become stranded.

****

LIVING CLOSE TO THE LEDGE

Niche width analysis:

Background and theory

The concept of ecological niche is central to the study of ecology (e.g. Odum 1971; Pianka 1978) and has been borrowed by archaeologists via cultural anthropology (Hardesty 1975, 1980). In ecology two concepts of niche have been defined: the fundamental niche or 'sum total of the [potential] adaptations of an organismic unit' (Pianka 1978:238), and the realized niche, which includes all of the adjustments actually made by an organismic unit in its environment (Hutchinson 1978). Ecologists have subdivided the niche concept to make it more manageable, considering, for example, trophic niche, temperature niche, space niche, and so on, as separate phenomena (e.g. Odum 1971).

In anthropology the organismic unit usually considered is the human population, and most studies have attempted to define the realized niches of populations; the dimension most frequently considered has been trophic niche (Hardesty 1975). These orientations are also typical of archaeological studies of niche, where the emphasis has been on the subsistence practices of particular populations in the past (Hardesty 1980). The measure known as niche width has most often been used to quantify this concept in archaeological studies (e.g. Barber 1982; Christenson 1980; Hardesty 1980; Kirch 1980).

The formula used for niche width calculations, adapted from Levins (1968:44-45; Hardesty 1980:166), is:

(1) $$N.W. = 1/\sum_{i}^{n}(Pi)2$$

where 'N.W.' is the niche width, 'n' is the number of resources exploited, 'i' is a particular resource, and 'Pi' is the proportion of the ith resource in the assemblage. '$\sum$' is the mathematical symbol for summation. The formula produces numbers between '1' and 'n'; the lower the number, the more specialized the subsistence strategy. A perfect specialist subsists on a single resource; a perfect generalist exploits 'n' resources equally. The niche width model produces a useful summary statistic for comparing archaeological faunal assemblages and provides a measure which can be interpreted in terms of general ecological principles (e.g. Hardesty 1980; Christenson 1980). To operationalize the measure for comparison of archaeological assemblages, it is imperative that the taphonomy of the assemblages be similar, and that the raw faunal data are quantified using the same currency (Kirch 1980).

Barber (1982:98-99) used the niche width model to measure the degree of specialization in subsistence activities represented by the faunal assemblage from the Wheeler's site, a Middle Woodland shell midden located on the Merrimack River estuary in Massachusetts. He concluded that the inhabitants of that site were engaged in seasonally (autumn) specialized (niche width =

1.51) intensive exploitation of shellfish (soft-shelled clams) for preservation, storage and consumption in other seasons. Barber (1982:95-98) characterizes the subsistence strategy at Wheeler's as bifocal, distinguishing between specialized food procurement for storage and generalized food procurement for day to day subsistence during the occupation of the site.

In 1985 I applied the niche width model to a small sample of faunal material from the Weir site (see Black 1988:10-38). The balance of this chapter is an elaboration and refinement of that analysis. Previous characterizations of Quoddy region prehistoric subsistence have tended to downplay the importance of marine resources, and to characterize prehistoric subsistence as a generalized adaptation to the Quoddy region environment (e.g. Sanger 1985a:11, 1986:151-152). The purpose of the present analysis is to evaluate this contention.

Methods

The following criteria were used in selecting faunal remains for inclusion in the subsistence analysis. All of the probably intrusive remains such as those of voles, all of the faunal individuals represented only by artifactual and structural remains (such as the whales and many of the rodents), and all of the Euro-Canadian domestic species (cattle, swine, sheep), have been excluded. For mammals, only faunal individuals from which at least 2 skeletal elements were identified are included. For birds, following Ericson's (1987) taphonomic study of bird remains, faunal individuals represented by extremity bones are included, and individuals represented only by cranial and/or axial elements are excluded. For fish, individuals from which at least 2 skeletal elements were identified, or 1 identified element associated with elements identified to the appropriate family and of the appropriate size, are included. For invertebrates, only marine shell species have been included.[3]

Both vertebrate faunal individuals and invertebrate remains associated with layers 1 and 4 in the Camp site have been excluded. This is to remove, as much as possible, faunal inputs from the historic occupations and from prehistoric occupations other than the Late Maritime Woodland ones. No subsistence data are presented for the Northeast Point site because the criteria adopted exclude its few faunal specimens from consideration.

The currency used in this analysis is equivalent meat weight. Table D-6 shows the ratios used to convert the vertebrate faunal remains to equivalent meat weights.[4] Table D-8 shows the ratios used to convert the invertebrate remains to equivalent meat weights.[5] The equivalent meat weights used for subadult and juvenile mammalian individuals have been arbitrarily set at 60% and 30% respectively of the adult values.

One of the problems with the niche width formula is that the absolute size of the value calculated for a particular case is related to the number of resources (n) in that case. This means that niche widths calculated for different populations, exploiting different numbers of resources, are not directly comparable. Biologists (e.g. Levins 1968:44) have dealt with this difficulty by converting niche widths to standardized scores.

In most applications of niche widths to anthropological and archaeological data, each prey species has been treated as a separate resource. From the perspective of cultural ecology, this approach makes little sense.6 Many paleotechnic capture techniques would not be 'species specific'. For example, an intertidal weir might only capture fish of a certain size, but there might be several species of that size captured at any particular time. Similarly, traps for small mammals might be size or behaviour specific, but not species specific.

With these points in mind, I have inferred 12 'resource categories' from the faunal remains actually preserved in the Bliss Islands sites, and quantified the faunal data in terms of these categories. In effect, this means that I have adopted an upper limit of 12.0 for niche width values.

The resource categories inferred are summarized in Table D-9. Each category consists of an environmental zone, a resource type, and suggested techniques by which the faunal resources might have been taken. The suggested techniques are based on ethnohistoric and ethnographic analogies; no attempt has been made to substantiate the use of these techniques archaeologically. Table

D-9 also lists the species represented in the Bliss Islands faunal assemblages that might have been taken with each strategy.

For example, resource category 1 includes intertidal infauna. Exploitation of these would involve digging and gathering. The main species taken in this manner on the Bliss Islands was the soft-shelled clam. Resource category 10 includes capturing small fur-bearing mammals in riverine and coastal forest habitats. Capture techniques for these animals might have included traps, snares, and hunting with bow and arrow. Species from the Bliss Islands assemblages that might have been taken in this manner include squirrel, muskrat, porcupine, beaver, raccoon and otter.

The validity and usefulness of the niche widths calculated in this study rest on a recognition of the limitations of the data and methods used: i) only resources represented in the faunal assemblages are considered;[7] ii) the resource categories used are intuitive (different groupings would yield different results); iii) the resource categories are based on the archaeologically visible remains and represent a subset of the subsistence strategies actually practiced by prehistoric people on the Bliss Islands; iv) following from the previous point, the niche widths calculated measure subsistence specialization in a subset of the realized niche of these people.[8]

Results

Details of the calculations of niche width for each of the Bliss Islands analytical units are shown in Tables D-10 to D-20. Each of these tables shows the subsistence strategies represented in a particular analytical unit, the species exploited, the meat weight equivalent for each species, the total equivalent meat weight for the assemblage, the proportion of the meat weight assemblage derived from each subsistence strategy, and the calculations resulting in the niche width value. The values are summarized in Table 6-3.

These data suggest that all of the Bliss Islands analytical units represent relatively specialized subsistence strategies. In no case does an assemblage achieve more than 37.0% of the potential niche width (the standard scores can be read as proportions of potential niche width). The mean proportion of potential niche width for the nine independent measurements is 24.8% (standard deviation = 7.63%). It is important to note that if the niche widths were calculated in terms of all of the subsistence strategies suggested by ethnographic accounts, or in terms of a 'fundamental niche' including all potentially exploitable resources in the Quoddy region, the effect would be to make Bliss Islands prehistoric subsistence practices appear even more specialized.

The Camp site is the least specialized site, and the Ledge site the most specialized. The niche width data complement the

Table 6-4: Niche widths calculated for Bliss Islands faunal assemblages.

site:	unit:	niche width:	standard score:	details:
Camp:	total	3.81	0.3175	Table D-15
	layer 3	2.63	0.2192	Table D-16
	layer 2	4.44	0.3700	Table D-17
Weir:	total	3.53	0.2942	Table D-10
	s.c. 4	3.37	0.2808	Table D-11
	s.c. 3	3.75	0.3125	Table D-12
	s.c. 2	2.33	0.1942	Table D-13
	s.c. 1	2.90	0.2417	Table D-14
Northeast Point:	--	no data	--	--
Ledge Site:	--	1.49	0.1242	Table D-20
Lighthouse Cove:	--	3.44	0.2867	Table D-18
Pintlowes Cove:	--	1.65	0.1375	Table D-19

****
LIVING CLOSE TO THE LEDGE

TABLE 6-5: Proportions of zoological classes in the Bliss Islands faunal assemblages quantified by equivalent meat weight.

Provenience: site:	Zoological Classes: mammal:	avian:	fish:	shellfish:
Camp:	56.72	3.43	2.20	37.66
Weir:	26.47	1.10	2.60	69.83
Northeast Point:	no data			
Ledge Site:	0.00	0.00	4.81	95.19
Lighthouse Cove:	31.16	11.13	19.48	38.23
Pintlowes Cove:	25.77	0.00	0.00	74.22

similarities discussed above between the Camp site, the Lighthouse Cove site, and the Weir site stratigraphic component 4 assemblages.

Table 6-4 shows the proportions of each of the faunal classes in each of the analytical units when calculated by equivalent meat weights rather than by piece counts. These data indicate that with the exception of the Camp site shellfish are the predominant resource harvested at all of the Bliss Islands sites. Since excavations at both the Weir and Camp sites were concentrated in areas containing high proportions of living-floor deposits rather than shell middens, it is probable that these data underestimate the actual importance of shellfishing.

Stable Isotope Analysis:

To further explore prehistoric subsistence practices on the Bliss Islands, 10 ceramic body sherds with encrustations of carbonized material on their inside surfaces were analyzed by the stable isotopes technique.9 Provenience and contextual data for these sherds are shown in Table 6-6. One sherd from the Weir site is from an Early Maritime Woodland context (stratigraphic component 2), 4 sherds from Weir site stratigraphic component 3 are from Middle Maritime Woodland occupations, and 5 sherds from the Camp site are from Late Maritime Woodland occupations.

The basis for the isotopic method of studying paleodiet is as follows:

> Nitrogen isotope ratios separate modern plants into two groups: legumes, capable of fixing atmospheric nitrogen, and non-leguminous plants, which must use nitrogen from the soil. Carbon isotope ratios also separate modern plants into two groups, C3 plants and C4 plants and crassulacean acid metabolism (CAM) plants, which differ in the enzymes that catalyze initial CO2 fixation. Because all legumes are C3 plants and no C4 or CAM plant is known to fix atmospheric nitrogen, combined C and N isotope analysis can be used to separate living plants into three groups: legumes, non-leguminous C3 plants, or C4 and CAM plants (Hastorf and DeNiro 1985:489).

These differences in C and N isotope ratios are passed through food chains to animals at various trophic levels. There is also a ca. 7‰ difference in C isotope ratios between oceanic and atmospheric carbon that is maintained through trophic levels (Chisholm et al. 1982). In addition,

> Nitrogen isotope ratios undergo marked trophic level fractionation. Organisms from higher trophic levels are enriched in the heavier [15N] isotope, compared to their food (Sealy et al. 1987:2707).

Thus, the flesh of animals from different trophic levels, in both marine and terrestrial food chains, can be distinguished from one another by comparing C and N isotope ratios.

This principle has been applied in two ways to study human paleodiets. Some researchers have analyzed collagen from subfossil human bones (e.g. Chisholm et al.1982; Schwarcz et al. 1985) to estimate the proportions of various food groups consumed by prehistoric people; other researchers (e.g. Hastorf and DeNiro 1985; Morton 1987; Morton and Schwarcz 1988) have analyzed carbonized plant and animal remains from archaeological contexts, particularly carbon encrustations from ceramic body sherds, to determine the composition of prehistoric diets and the uses of ceramic vessels.
Since human skeletal material is rare in Quoddy region prehistoric archaeological sites, but ceramic sherds are relatively common, the latter approach has been adopted in this study.

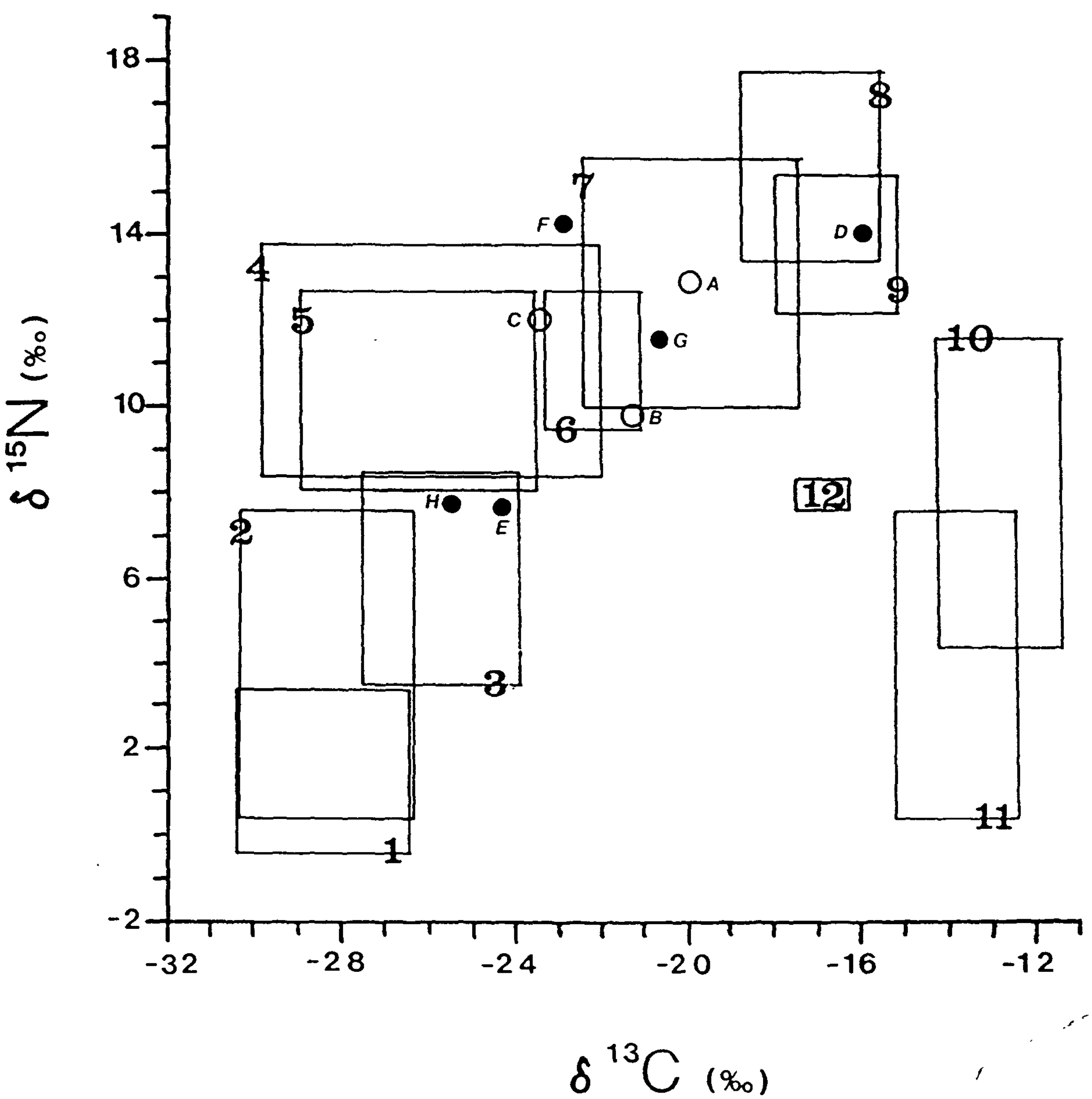
The δ 13C and δ 15N values measured for each of the sherds are shown in Table 6-6.10 For two of the sherds from the Camp site only δ 13C could be measured due to small sample sizes. In Figure 6-6 values of δ13C and δ15N for various food groups are shown.11 The values for the eight Bliss Islands sherds from which both δ13C and δ15N values were obtained are plotted in relation to these food groups.12

One of the sherds from the Weir site (#1328) falls in the marine mammal and marine fish ranges of the graph. This sherd is

TABLE 6-6: Ceramic sherds from the Camp and Weir sites analyzed by the stable isotopes technique.

Provenience:	Spec#:	δ13C‰:	δ15N‰:	Ceramic:	Context:	Faunal associations:
Camp (BgDq4):						
C2 L.2	858	-15.390	----	grit temper	living floor	mammal
D4 L.3	1236	-24.776	----	grit temper	living floor	mammal (Can., A.a., R.t., C.c.) bird fish
D5 L.3	1328	-19.929	12.925	grit temper dentate stamp	midden clam	mammal (A.a.) bird (M.s.)
E4 L.3	1436	-21.270	9.826	grit temper	midden clam and urchin	mammal (A.a., P.v., C.c.) bird (H.l., B.c.)
SA3 L.4	1559	-23.432	12.044	grit temper	midden clam	mammal (C.c., O.v.) bird fish (G.L.)
Weir (BgDq6):						
M5 s.c.3	1332	-15.769	14.061	grit temper dentate stamp	interface layer	mammal (H.g.)
N3 s.c.3	1521	-25.670	7.784	grit temper dentate stamp	living floor	mammal (Can., C.c., Mus.)
N4 s.c.3	1792	-22.857	14.298	grit temper	midden clam and urchin	mammal (C.c., E.d.) fish (S.F.)
N4 s.c.3	1833	-20.650	11.592	grit temper	midden clam and urchin	mammal (H.g.) bird
N7 s.c.2	2381	-24.299	7.726	grit temper	midden sea urchin	mammal fish (G.L.)

FIGURE 6-6: Graph showing $\delta 13C$ and $\delta 15N$ for various food groups, and isotope measurements from the Bliss Islands ceramic sherds in relation to the food groups. The numbered boxes in the graph represent mean values (+/-1σ) for: 1) legumes; 2) C3 plants; 3) C3 herbivores; 4) migratory birds; 5) freshwater fish; 6) anadromous fish; 7) marine birds; 8) marine mammals; 9) marine fish; 10) C4 herbivores; 11) C4 plants; and 12) marine shellfish. The open points represent ceramic sherds from the Camp site: A = 1328; B = 1436; and C = 1559. The solid points represent sherds from the Weir site: D = 1332; E = 1521; F = 1792; G = 1833; and H =2381.


18
14
10
6
2
-2
-32
-28
-24
-20
-16
-12
δ ¹⁵N (‰)
δ ¹³C (‰)
1
2
3
4
5
6
7
8
9
10
11
12
A
B
C
D
E
F
G
H

from a distinct interface between two shell midden layers. Virtually the only faunal remains associated with this interface are the bones of a large immature grey seal that was butchered and whose bones were gnawed by canids. I interpret the encrustation on this sherd as resulting from the cooking of marine mammal meat, possibly from this grey seal.

Two sherds from the Weir site (#1521, #2381) fall in the C3 herbivore range. One (#1521) is from a Middle Maritime Woodland living floor, and is associated with dog, beaver and mustelid remains. The other (#2381) is from an Early Maritime Woodland sea urchin shell deposit and is associated with a few terrestrial mammal and large fish bones. I interpret the encrustations from these sherds as resulting from the cooking of meat from terrestrial herbivores, probably cervids.

The final two sherds from the Weir site (#1792, #1833) are intermediate between the extremes represented by the other sherds. They fall in or near the anadromous fish, migratory bird and marine bird ranges of the graph. Both are from shell midden deposits; one is associated with terrestrial mammal and small fish remains, the other with marine mammal and bird remains.

There is no evidence for the exploitation of anadromous fish on the Bliss Islands, so that interpretation of these sherds can be discounted. However, since encrustations resulting from cooking a combination of foods from different food groups will produce isotope measurements intermediate between the food groups represented (Morton 1989:p.c.), the encrustations from these two sherds can be interpreted in one of three ways: i) they may reflect the cooking of meat from marine and/or migratory birds; ii) they may reflect the cooking of combinations of marine and terrestrial animal foods; or iii) they may reflect repeated use of the ceramic vessels to cook terrestrial and marine animal food with minimal cleaning between cooking episodes, resulting in cumulative encrustations. I would discount the first of these interpretations because of the relatively small amounts of bird remains present in Weir site stratigraphic component 3.

The three sherds from the Camp site plotted on Figure 6-6 (#1382, #1436, #1559) fall in the same area of the graph as the latter two sherds discussed from Weir, and present similar interpretive possibilities. However, since all three sherds are associated with mammal and bird remains, but only one with fish remains, and since bird remains are relatively common in the Camp site, it is more difficult to choose one interpretation over the other. The encrustations on these sherds may reflect either the cooking of migratory and marine birds, or combinations of marine and terrestrial foods.

Chisholm et al. (1982) indicate that 13C/12C ratios alone can be used to distinguish between flesh from terrestrial vs. marine animals. The $\delta 13C$ values for the other two sherds from Camp suggest that one (#858) reflects cooking of marine foods, while the other (#1236) reflects cooking of terrestrial foods. These results cannot be further interpreted. It is unfortunate that N isotope measurements could not be obtained from these sherds, because the C isotope measurements indicate that the range of variation represented by the sherds from the Camp site may be the same as the range represented by the sherds from Weir.

Several negative results of this analysis should also be noted. Not surprisingly, there is no evidence for domesticated plants having been used prehistorically on the Bliss Islands. However, there is also no compelling evidence for the cooking of either terrestrial or marine wild plants.13 Most surprising is the lack of evidence for shellfish meat having been cooked in ceramic vessels. Schwarcz (1989:p.c.) suggests that because of the distinctly linear array of the data points, and the fact that the shellfish data are well off the trend of this array, it is unlikely that shellfish contributed to any of the intermediate isotope values.

In summary, stable isotope analysis of encrustations on ceramic sherds suggests several points relevant to an understanding of Bliss Islands prehistoric subsistence. Ceramic vessels appear to have been used mainly for cooking animal foods. The carbonized encrustations on these vessels reflect the composition of the faunal assemblages with which they are associated, and substantiate the assumption that these faunal assemblages largely represent food remains, and, at least at the Weir site, represent relatively short term specific subsistence events. Finally, this analysis suggests that the emphasis on animal vs. plant foods reflected in the assemblages may be a real reflection of prehistoric subsistence practices, not just an artifact of preservation. In the Early and Middle Maritime Woodland occupations especially, at least during the seasons of occupation represented at Weir, plant foods may have contributed only casually to the diet.

Interpretations of Bliss Islands prehistoric subsistence:

This analysis of the subsistence remains from the Bliss Islands sites suggests a number of interpretations of prehistoric subsistence patterns in the Quoddy region which run counter to previous interpretations. The evidence indicates that: i) subsistence practices were relatively specialized; ii) shellfish were by far the most intensively and consistently exploited resource; and iii) changes in subsistence practices are detectable within the period from 2500bp to 1000bp.

The evidence for specialization in subsistence contradicts Sanger's (1985a:11) contention that 'lack of specialization is what one might expect of hunters and gatherers foraging in this species rich region', and substantiates Barber's (1982) and Christenson's (1980) predictions from general ecological theory that diverse, productive environments will encourage specialized subsistence practices on the part of humans. Ecological theory suggests that specialized adaptations are always more efficient, and will be adopted wherever possible. Barber (1982:91-93) sees two factors which act to limit this principle: i) the environment must be highly productive, and ii) the resources must be relatively stable. As discussed above, the Quoddy region is a highly productive environment, but one with marked seasonal fluctuations in resource availability. Shellfish are the most stable easily accessible resource in the region, and it is not surprising, then, that they were the focus of prehistoric subsistence on the Bliss Islands.

This discussion leads naturally to the second point, that shellfish were intensively exploited by prehistoric people on the Bliss Islands, at least during the Middle and Late Maritime Woodland periods. Additional information will have to be gathered to evaluate whether this was the case during the Early Maritime Woodland and protohistoric periods as well. However, enough evidence is presented here to suggest that shellfishing was a significant subsistence activity during those times, and that shellfishing has been consistently practiced in the Quoddy region throughout the period under consideration.

The Camp site faunal assemblage could be interpreted as representing a bifocal subsistence strategy, emphasizing shellfish and cervids, similar to Barber's interpretation of the Wheeler's site (Black, Gruspier and Johnston 1988). Each of the stratigraphic components in the Weir site could also be interpreted as representing bifocal strategies: stratigraphic component 1 emphasizing shellfish and vertebrate fish; component 2, shellfish and cervids; components 3 and 4, shellfish and seals. The subsistence economy of the Weir site as a whole would have to be characterized as trifocal (cf. Black 1988b:19-20).

However, none of the faunal assemblages is as specialized or as dichotomous as Wheeler's, and apparently the Bliss Islands sites represent more generalized subsistence practices. Thus, while it is possible that small scale food preservation may have been practiced at Quoddy region shell middens, I have not adopted Barber's functionally specialized, seasonally specific model of shell midden occupation for the Weir site (Black 1988b:21-22), or for any of the other Bliss Islands sites. I have argued elsewhere (Black and Whitehead 1988:25-26) that demonstrating this practice from archaeological evidence alone is problematic. However, the isotopic analysis indicates that while marine and terrestrial mammal meat, and perhaps fish and birds, were cooked in ceramic vessels, shellfish were not. Shellfish may have been eaten raw, but it is tempting to conclude that they were dried and/or smoked.

There is some indication in the Weir site data of a trend from more specialized to less specialized subsistence patterns over time. In part, this may reflect sampling. If most of the with the later (stratigraphic components 3 and 4) assemblages in the main excavation block, as is suggested by the dating and stratigraphy in that unit (Black 1985a:47-48, 97-100), inclusion of data from this area would reduce the niche widths for those components to values similar to those for components 1 and 2.

On the other hand, the trend from almost exclusively marine exploitation to a combination of marine, terrestrial and avian resource exploitation through time is clear. Also, my preliminary analysis of the Weir site data suggests a broadening of the niche width through time with respect to shellfish exploitation itself (Black 1988b:19-20).14 If the Camp site is considered to be representative of Late Maritime Woodland occupations generally, then the interpretation of an overall broadening of niche width through time is further substantiated.

This consideration may also be complicated by the nature of many of the resources which broaden the niche measurements in the later components. It could be argued, for instance, that birds were exploited as much for ornamentation and tools, small mammals for furs, and beaver and other rodents for tools, as for subsistence resources. If so, these faunal individuals would be partially or wholly irrelevant to a consideration of trophic niche width. At any rate, whatever the reasons for the exploitation of particular faunal resources, the evidence from stratified sites in the insular Quoddy region sites runs counter to Sanger's

(1986:151-152) interpretation of the Quoddy Tradition as representing 'a stable approach to procurement over a period of 1500 years.'

Of course, in dealing with the subsistence practices of potentially mobile hunter-gatherers, the crucial variables of seasonality and subsistence round have to be considered. It may be that the changes in subsistence patterns which have been interpreted as temporal trends in this chapter partially reflect changes in the seasons of occupation of the coastal sites. It is to this consideration that I turn my attention in the following chapter.

Notes:

1. Less than 0.5% of the vertebrate faunal remains were unidentifiable to zoological class. To simplify the data presented here, these unidentified pieces are grouped with mammal bone fragments; most of these pieces are quite small and have undergone severe surface destruction.

2. Both artifactual and faunal bones are included in the piece counts presented in this chapter and in Appendix D.

3. The invertebrate remains from the Bliss Islands sites also include terrestrial gastropods. A number of species, including *Cionella lubrica*, *Vallonia pulchella*, *Anguispira alternata*, *Discus catskillensis*, *Heliodiscus parallelus*, *Zonitoides arboreus*, *Cepaea hortensis*, *Succinea* sp. and *Retinella* sp., have been identified by D. Davis, Curator of Natural History at the Nova Scotia Museum, in column samples from the Weir, Camp, and Lighthouse Cove sites. The distribution of terrestrial gastropods in the sites suggests

that they were introduced during the formation of soil horizons on the site surfaces (cf. Black 1983:103-105). Since they do not represent food remains, the terrestrial gastropod species are not considered further here.

4. The data in Table D-6 have been drawn from information in Banfield (1974), Barber (1982), Liem and Scott (1966), Rojo (1986), Stewart (1974), Stewart and Stahl (1977) and White (1953).

5. The data in Table D-8 have been calculated from my measurements of meat:shell ratios for Quoddy region shellfish (see Black 1983:233-268; Black in press b).

6. Treating each species as a separate resource increases the probability that the niche width will measure environmental diversity more than it measures subsistence specialization. I have treated these criticisms of prior applications of the niche width model to anthropological data at greater length in Black (1985b).

7. One notable omission from this analysis is the contribution of plant foods to the diet. Several of the Bliss Islands analytical units, especially Weir site stratigraphic component 4, Camp site layer 4, and the Lighthouse Cove site contain carbonized plant remains. These have been studied preliminarily by M. Deal (Memorial University) and C. Warman (St. Mary's University); identified species include Impatiens biflora (common touch-me-not), Rubus strigosus (wild raspberry), Prunus pennsylvanicus (pin cherry) and Vaccinium sp. (cranberry). These carbonized plant remains may result from aboriginal subsistence practices and/or from slash and burn clearing of site surfaces. They are not considered further here because so few specimens have been recovered, and because of the difficulty involved in developing a method of quantification which results in comparable data for plant and animal resources (e.g. Miksicek 1987:238).

8. I recognise that by adopting the methods that I have in this chapter, I have run roughshod over a number of controversial issues in zooarchaeology, including the validity of MNI counts (e.g. Grayson 1978, 1979:205-224) and the various techniques for calculating MNIs (e.g. Casteel 1977; Grayson

1973), proportional representation of faunal individuals (e.g. Lyman 1982:360-362; Sanger 1986:152), appropriateness of particular currencies (e.g. Casteel 1978; Grayson 1979:224-226; Lyman 1979, 1982:362-363; Waselkov 1987:119-123), and so on. In the end, one must choose methods, apply them, and attempt to learn something, or remain forever bogged down in a methodological morass. As Waselkov (1982:76) has so eloquently stated, 'each archaeologist must decide which method, and concomitant source of error, is less objectionable for the particular problem at hand.'

9. The technical work for this analysis was performed by J.D. Morton and M. Knyf, Dept. of Geology, McMaster University.

10. The isotopes are measured in parts per mil (‰). The standard used for δ13C is CO2 prepared from Pee Dee belemnite limestone (PDB); the standard for δ15N is the atmospheric nitrogen:

2) $$\delta 13C = [(Rx/Rs)-1]100$$

where Rx = 13C/12C of sample 'x' and Rs = 13C/12C of PDB standard;

3) $$\delta 15N = [(Rx/Rs)-1]100$$

where Rx = 15N/14N of sample 'x' and Rs = 15N/14N of atmospheric nitrogen.

11. Ranges for δ13C and δ15N for the food groups shown in Figure 6-6 are derived from data presented in Bender 1971; Chisholm et al. 1982; DeNiro 1985; Katzenberg 1987; Keith et al. 1964; Schoeninger and DeNiro 1984; Sealy et al. 1987; Shearer and Kohl 1978; and Virginia and Delwiche 1982.

12. The interpretations presented in the balance of this section are tentative since few of the species on which the isotopic ranges in Figure 6-6 are based have been sampled from the Maine/Maritimes area and adjacent parts of the Atlantic Ocean. The data shown here for marine shellfish are based on samples from South Africa (Sealy et al. 1987); however, Schwarcz (1989:p.c.) has unpublished data from Nova Scotia shellfish indicating that Maine/Maritimes shellfish fall in

the same range for $\delta 13C$ and $\delta 15N$.

13. Marine plants have $\delta 13C$ values in the same range as C4 plants (Bender 1971) and so are unlikely to have contributed to the isotope measurements from the Bliss Islands sherds.

14. The niche widths in Black (1988b:36) were calculated using different methods than those described in this chapter: each shellfish species was considered a separate resource category.

****
LIVING CLOSE TO THE LEDGE

CHAPTER 7:

SEASONALITY PATTERNS OF THE BLISS ISLANDS SITES.

> "At the other end--I shall call it time's cycle--events have no meaning as distinct episodes... Apparent motions are parts of repeating cycles... Time has no direction..." (S.J. Gould in Time's Arrow, Time's Cycle)

During the 1960s and 1970s shell middens on the Quoddy region mainland were considered to represent late autumn/winter/spring occupations, and to be part of a seasonal round that also included interior occupations during the summer. However, Sanger (1982) suggested there is also evidence for summer, and perhaps for year-round occupation of the coast. I presented evidence for warm season occupations at the Partridge Island site and suggested a possible warm season/outer coastal, cold season/inner coastal seasonal round operating within the region (Black 1983:156-160).

My purpose is in this chapter is to determine the seasons of occupation represented by the Bliss Islands analytical units (cf. Black 1983:158). I have adopted Monks' (1981:229-230) philosophy that seasonality must be approached through a system of multiple working hypotheses, and with a number of different types of data. Three types of information are drawn upon here: ethnohistory, natural history and growth increment analyses.

Economic seasons:

The resource categories defined in the previous chapter can be thought of as representing 'economic seasons'. Joachim (1976) defines an economic season as 'the calendar months in which a consistent and recognizable set of subsistence activities occur'. Monks (1981:176) sees the definition of economic seasons in archaeology as the construction of an etic calendar of cultural events. Several economic seasons may overlap in a single calendrical season.

My attempt to construct a cultural calendar of subsistence events on the Bliss Islands consists of three steps: i) inferring the seasons of exploitation of particular faunal individuals and species; ii) inferring calendrical equivalences for the exploitation of each resource category; and iii) inferring the season(s) of occupation represented by each of the analytical units. Following are brief discussions of the principles and assumptions I have adopted in making these inferences.

The seasonality inferences are based on analogies with modern conditions in the Quoddy region. As discussed above, I assume these conditions have been roughly the same for the past 2500 years.

All seasonality inferences should be considered probability statements (Monks 1981:231). Seasonality estimates are subject to a margin of error introduced by year to year fluctuations in the natural parameters governing the behaviour of animal populations. This margin of error is compounded as one advances from inferring the seasonality of particular faunal individuals to inferring the seasons of occupation represented by archaeological faunal assemblages. Methods for quantifying this margin of error have not been developed; nevertheless it must be kept in mind.

At the assemblage level there are two contrasting approaches to interpreting seasonality information. One of these, a minimalist approach, would interpret a narrow range of seasonality indicated by the most plentiful and reliable data, and interpret evidence outside this range as representing the margin of error in the techniques and information employed. The other, maximalist approach would interpret a wider range of seasonality from all of the available information. I have adopted the latter approach, with the qualification that not all seasonality information is of equal reliability.

As Monks (1981:230-31) notes, it is unwise to assume that location and time of acquisition of a resource coincide with location and time of archaeological deposition. However, animals exploited locally are more reliable indicators of season of occupation that animals which may have been brought in from more distant habitats. Animals more completely represented in a faunal assemblage are more likely to have been locally exploited than those less completely represented. Similarly, animals exploited for food are more reliable seasonality indicators than animals exploited for other reasons (e.g. tools, clothing, ornaments), because food remains are less likely to be transported 'across' seasonal boundaries. This assumption could be confounded by preservation and storage of food resources, but in most cases only edible portions of preserved animal foods will cross seasons, and archaeologically visible portions (ie. large and diagnostic bones) will remain at the place where the resources are exploited and/or preserved. In the Bliss Islands case, these principles indicate that shellfish, vertebrate fish, sea mammals, and aquatic birds are the most useful seasonality indicators in that order.

This analysis assumes that the principle of least effort applies to prehistoric subsistence activities (cf. Barber 1982:52; Winterhalder and Smith 1981; Zipf 1949). This means that resources will be preferentially exploited when at their most productive and/or when most accessible. For example, in the present case, this principle suggests that vertebrate fish were harvested inshore rather than offshore.

Direct means of seasonality determination such as growth increment analyses of archaeological specimens are superior to indirect means of interpretation based on presence/absence data and analogies with natural history information and ethnohistoric accounts. This is particularly true if faunal specimens can be selected to prevent redundant seasonal interpretations of a single faunal individual (Monks 1981:224). This is the case, for example, with soft-shelled clam chondrophores, because there is only one chondrophore per clam, and for mammal teeth, if tooth position and/or age at death of the individual can be determined.

Methods of seasonality assessment:

Ethnohistory

Ethnohistoric evidence for seasonality has been discussed extensively in the archaeological literature of the Maine/Maritimes area; it will be addressed only briefly here. Table 7-1 summarizes evidence for the calendrical duration of subsistence strategies drawn from ethnohistoric sources (cf. Christianson 1979:113).

Shellfishing was observed as a warm season activity, and, in general, vertebrate fish were taken during the warm seasons. There is no information about the exploitation of terrestrial birds; however, waterfowl and shorebirds were taken during the warm seasons. Exploitation of passenger pigeons took place in July and August.

There is no information about the exploitation of harbour seals. Descriptions of sealing during the winter refer specifically to grey seals.

Cervids were apparently hunted throughout the year, but most intensively during the cold seasons. Small furbearing mammals were apparently taken in all seasons except mid-winter, but their exploitation was most strongly associated with spring and autumn.

TABLE 7-1: Seasonality of aboriginal faunal exploitation in the Maritimes during the seventeenth century according to ethnohistoric sources.

Resource Categories:	species:	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.
		Period of Exploitation:											
1)	general					======	======	======	======	===			
2)	general					======	======	======	======	===			
3)	general					======	======	======	======	===			
	anadromous			===	======								
	tomcod												======
4)	general					======	======	======	======	===			
	Ang.									======			
5)	Bo.um.					======	======	======	======	======			
6)													
7)	waterfowl					======	======	======	======	===			
	bird eggs				===								
	E.m.							===	===				
8)	H.g.	======											
9)	general	======	======	======	------	------	------	------	------	------	------	======	======
	A.a	------	======	======	------	------	------	------	------	------	------	------	------
	R.t.	======	======	======								======	======
10)	C.c.		======	======	===---	------	------	------	------	------	======	======	
	L.c.		======	======	===								
11)	U.a.	------	------	------	------	------	------	------	------	------	------	------	------
12)	Can.	------	------	------	------	------	------	------	------	------	------	------	------

Key:

======	most important season of exploitation
------	less important season of exploitation
blank	no information/no indication of exploitation

Strategies were recorded for exploiting bears in all seasons. Mention is made of dogs being eaten on ceremonial occasions, but no specific season was ascribed to this practice.

In summary, the ethnohistoric information indicates a pattern in which shellfish, fish and birds were exploited in the warm seasons, and marine and terrestrial mammals in the cold seasons. Ethnohistoric accounts also indicate four economic seasons not represented in the Bliss Islands faunal assemblages: i) fishing for anadromous fish at heads of tide on major rivers during the spring; ii) fishing for tomcod through the ice on estuaries during the winter; iii) gathering birds eggs during the spring; and iv) gathering of plant foods (especially berries) in late summer and early autumn. The first two of these additional strategies are not represented on the Bliss Islands because the absence of significant freshwater sources and negligible development of sea ice in the insular Quoddy region, preclude their being practiced. Birds eggs and plant foods were probably exploited at insular locations, but evidence of these practices is unlikely to be preserved in the archaeological record.

Natural history

Seasonality interpretations from natural history information are summarized in Table 7-2. Information for terrestrial mammals is taken from Dilworth (1984) and Squires (1968), and for sea mammals from Hoyt (1984), Beck (1983) and Banfield (1974).

TABLE 7-2: Seasonality of animal species identified in the Bliss Islands faunal assemblages according to natural history information.

Resource Categories:	species:	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.
		Period of Exploitation:											
1)	M.a.	=	=	=	=	=	=	=	=	=	=	=	=
2)	whelks	-	-	-	=	=	=	=	=	-	-	-	-
	S.d.	=	=	=	-				-	=	=	=	=
3)	G.S.	-	-	-	-	-	-	=	=	-	-	-	-
	Clu.	-	-	-	-	-	-	=	=	=	-	-	-
4)	M.o.	-	-	-	=	=	=	=	=	=	-	-	-
	G.m.	-	-	-	-	-	=	=	=	=	-	-	-
	Me.ae.			-	-	-	-	-	-	-	-	-	
	Po.vi.			-	-	-	-	-	-	-			
	Uro.			-	-	-	-	-	-	-	-	-	
	A.o.	-	-	-	-	-	-	-	-	-	-	-	-
5)	Bo.um.	-	-	-	-	-	-	-	-	-	-	-	-
	Ca.ca.	-	-	-	-	-	-	-	-	-	-	-	-
6)	P.i.	=	=	-	-	-	-	-	-	-	-	-	=
	U.l.	=	=	=	=					=	=	=	=
	A.h.	-	-	-	=	=	=	=	=	=	=	=	=-
	C.b.	-	-	-	-	-	-	-	-	-	-	-	-
	Lar.	-	-	-	-	-	-	-	-	-	-	-	-
	H.l.	-	-	-	-	-	-	-	-	-	-	-	-
	B.v.	-	-	-	-	-	-	-	-	-	-	-	-
7)	E.m.						=	=	=	=			
	Br.ca.			=	=	=	-	-	-	-	-	-	-
	A.r.	-	-	=	=	=	=	=	=	=	=	=	-
	An.ac.			=	=	=	=	=	=	=	=		
	Lo.cu.				-	=	=	-	-	-	=	=	
	B.c.	-	-	-	-	-	-	-	-	-	-	-	-
	S.m.	-	-	-	-	-	-	-	-	-	-	-	-
	Me.me.	-	-	-	-	-	-	-	-	-	-	-	-
	M.s.	-	-	-	-	-	-	-	-	-	-	-	-
8)	Cet.	-	-	-	-	=	=	=	=	=	-	-	-

```
              P.p.      ------------------------==============================------------------
              P.v.      ------------------------==============================------------------
              H.g.      ------------------------==============================------------------

      9)      A.a.      ==================------------------------------------==================
              R.t.      ==================------------------------------------==================
              O.v.      ==================------------------------------------==================

     10)      O.z.      ------------------------------------------------------==================
              E.d.      ------------------------------------------------------==================
              C.c.      ------------------------------------------------------==================
              P.l.      ------------------------------------------------------==================
              Ma.am.    ------------------------------------------------------==================
              L.c.      ------------------------------------------------------==================

     11)      U.a.      ------------------------------------------------------==================

     12)      Can.      ------------------------------------------------------------------------

------------------------------------------------------------------------------------------------
              Key:      ======      most probable season of exploitation
                        ------      available, but less likely to be exploited
                        blank       unavailable/unlikely to be exploited
```

Information for birds is taken from Squires (1952, 1976), for fish from Liem and Scott (1966), Scott and Scott (1988) and MacDonald et al. (1984), and for shellfish from Brinkhurst et al. (1975) and MacKay (1976).

Both infaunal and epifaunal invertebrates could have been gathered throughout the year, and, thus, are poor seasonality indicators on a presence/absence basis. Mobile shellfish such as whelks and sea urchins might be somewhat less likely to be taken in cold seasons when they remain subtidal or low in the intertidal stratigraphy, and all shellfish tend to be at their least productive and tasty during the spawning season. However, these factors would not preclude shellfish gathering.

The green sea urchin is the only shellfish gathered on the Bliss Islands which has a definite seasonal productivity pattern. It is unlikely that urchins were gathered in late spring and summer, and most probable that they were gathered in autumn and winter.

Small fish, both Clupeids and juvenile Gadids, are inshore in the warm seasons and offshore in the cold seasons. At the Bliss Islands both herring and juvenile harbour pollock are inshore in large numbers in the late summer and early autumn; this is the most probable seasonality for this resource category. I suspect that the small Gadids in the Bliss Islands assemblages are juvenile pollock and Atlantic cod. However, since the small fish have not been definitely identified, it should be noted that Atlantic tomcod (Microgadus tomcod) are common inshore in the Quoddy region during the early summer (MacDonald et al. 1984:131). Thus, the presence of tomcod, even if demonstrated in faunal assemblages, cannot be interpreted as a definite cold season indicator.1

Most large fish are also warm season indicators in the Quoddy region. Sculpins and Atlantic cod move inshore in summer and offshore in winter. Pollock, haddock and hake are less likely to be caught than Atlantic cod because they prefer deeper water, but are good seasonality indicators because they tend to leave the region during the cold seasons. Since they are anadromous, sturgeon may be present throughout the year.

Terrestrial birds such as grouse could have been exploited at any time during the year, and are not good seasonality indicators. Shorebirds and raptors are also present throughout the year, but some, such as the great auk and the murres, are probably cold season rather than warm season indicators.

Some waterfowl such as mergansers and goldeneyes are present throughout the year. However, migratory waterfowl (especially ducks and geese) are usually present during the warm seasons and absent in the cold seasons. Passenger pigeons were definitely summer migrants.

Sea mammals are present throughout the year. However, because their movements are closely linked to those of vertebrate fish, seals are inshore in the warm seasons and offshore in the cold seasons. It is most probable that they were hunted when inshore. Whale strandings are rare in the eastern Gulf of Maine (Sanger 1988), but would most likely have taken place during the warm seasons when whales are inshore.

Cervids could have been hunted at any time during the year, but several factors suggest that autumn/winter hunting of cervids would be more probable than spring/summer hunting. Cervids are easier to track and trap in the cold seasons (Squires 1968:49-51) and the winter yarding behaviour of white-tailed deer may make them more accessible at that time. In late autumn and early winter cervids are at their most productive as a food resource. However, it is possible that islands were used as 'natural traps' for hunting cervids, and this advantage might have obviated the disadvantages of warm season cervid hunting at insular locations.

In general, both large and small furbearers could have been hunted or trapped at any time during the year and are not good seasonality indicators. However, they are at their most productive and desirable, as both food resources and for furs, during the late autumn and early winter.

Finally, canids might have been hunted at any time during the year, and are not good seasonality indicators. Most archaeological canid remains probably represent domestic dogs;

given that dogs were valued as hunting aides, they might have been eaten only as emergency rations during the lean seasons.

The natural history information coincides well with the ethnohistoric accounts. A seasonal contrast between warm season exploitation of vertebrate fish, sea mammals and sea birds, and cold season exploitation of terrestrial mammals is a logical adaptation to the Quoddy region environment in the absence of significant food preservation. Shellfish could have been exploited as a supplement to both warm and cold season subsistence strategies, and might have served as a short term staple in some seasons. The exploitation of the food resources represented in the Bliss Islands sites would not necessitate movements away from the coast (cf. Black 1983:159-160; Christianson 1979:120).

Growth increment analyses

Unfortunately, in contrast to the situation in Maine where a number of researchers (e.g. Bourque et al. 1978; Hancock 1982; Spiess and Hedden 1983) have applied growth increment analyses to the question of archaeological seasonality, this approach has been applied to only a few faunal remains from insular Quoddy region sites. However, the situation is better than for the mainland sites where no growth increment research has been conducted, largely because most of the mainland excavations took place before these techniques were routinely applied.2 I have previously suggested that a comprehensive study of site seasonality in the

Quoddy region should be undertaken through the growth increment analyses of a number of types of faunal specimens (Black 1983:163-164).3

In 1983 I presented growth increment data from thick-sections of 50 soft-shelled clams from the Partridge Island site suggesting, both warm and cold season shellfishing during the Middle Maritime Woodland occupations at that site (Black 1983:140-145). The methods that I used are not considered particularly reliable by researchers in Maine (Sanger 1984:p.c.). In 1986 I experimentally thin-sectioned five clam chondrophores from the Partridge Island site (Black et al. 1986). These sections substantiate my 1983 interpretation, but the sample size is too small to allow definite conclusions to be drawn. However, this research does indicate that further thin-sectioning of clam chondrophores would produce good quality seasonality information for Quoddy region shell middens.

Dr. Arthur Spiess (Maine Historic Preservation Commission) kindly volunteered to section a small number of faunal specimens from the Bliss Islands sites to facilitate seasonality interpretations. Eleven mammal teeth, including grey seal, harbour seal, beaver4 and deer teeth from the Weir site, and moose and deer teeth from the Camp site, were thick-sectioned and analyzed using the methods described by Bourque et al. (1978) and

Spiess (1976). The teeth exhibited poor histological preservation and only 3 teeth were interpretable.5

Two grey seal postcanines from the Weir site, one from an old (10+ years) individual, and one from a juvenile individual, indicate winter (January-February) hunting of grey seals. Both seal individuals are associated with shell midden deposits in stratigraphic component 3, and suggest winter occupation during the Middle Maritime Woodland period.

This information is significant because it substantiates ethnohistoric references to grey seal hunting during the winter breeding season, and my interpretation of grey seal remains at the Partridge Island site as being associated with a winter occupation layer (Black 1983:152-153). It contradicts the expectation, based on natural history information, that seals would most probably be exploited in the warm seasons. None of the harbour seal teeth sectioned were interpretable, but the separation of harbour and grey seal remains in the Weir site suggests that these species may have been exploited in different seasons. Moreover, there is evidence from other parts of the Maine/Maritimes area, based on tooth sectioning, for warm season exploitation of harbour seals (e.g. Sanger 1988:91; Stewart 1986:145).

An upper premolar from the moose individual associated with Camp site layer 3 indicates an autumn season of death. This suggests autumn occupation during the Late Maritime Woodland period.

Twenty-one soft-shelled clam chondrophores were thick-sectioned; acetate peels were used to record the growth records of the specimens, and were interpreted according the techniques described in Spiess and Hedden (1983:201-206). Ten chondrophores (column sample 5:4) were selected from a clam and sea urchin layer in the upper part of Weir stratigraphic component 3, and 11 chondrophores (column sample 5:10) from a clam and sea urchin layer in Weir stratigraphic component 2.6

Interpretations of the clam specimens are summarized in Table 7-3. Plus signs indicate interpretable specimens and minus signs uninterpretable ones; 19% of the specimens are uninterpretable and an additional 10% only partially interpretable.7 The ages of the specimens, the type of growth occurring at death (fast or slow), and the seasonality interpretation and rationale for it are shown for each specimen.

In sample 5:4 the most strongly indicated season is late winter (4 of 10 specimens). The other readings may be spurious, or may indicate a range of occupation spanning late autumn/winter/spring. Plate 7-1 shows the acetate peel from specimen 5:4G. This clam was harvested during the formation of the fast growth layer and indicates autumn seasonality.

In sample 5:10 the most strongly indicated season is late winter (5 of 11 specimens). Again, the other readings may be spurious, or may indicate a range of occupation spanning

TABLE 7-3: Growth annulus analysis of soft-shelled clam chondrophores from the Weir site.

Provenience and Specimen:		In/Unin:	Age:	F/S:	Seasonality Interpretation:	
5:4						
	A	+	6	S	annulus forming...	late winter
	B	+	?	F	100% expected growth...	winter
	C	+	6	S	annulus forming...	late winter
	D	+	?	F	warm season	
	E	+	?	S	annulus forming...	late winter
	F	-	--	--		
	G	+	?	F	75% expected growth...	autumn
	H	-	--	--		
	I	+	6	F	100% expected growth...	winter
	J	+	6	F	20% expected growth...	spring
5:10						
	A	+	?	F	100% expected growth...	winter
	B	+	?	F	warm season	
	C	+	10	S	annulus forming...	late winter
	D	+	26	F	27% expected growth...	spring
	E	+	6	S	annulus forming...	late winter
	F	-	--	--		
	G	+	5	F	28% expected growth...	spring
	H	+	3	S	annulus forming...	late winter
	I	+	6	S	annulus forming...	late winter
	J	+	7	S	annulus forming...	late winter
	K	-	--	--		

PLATE 7-1: Acetate peel of a soft-shelled clam chondrophore from the Weir site indicating warm season shellfish exploitation.

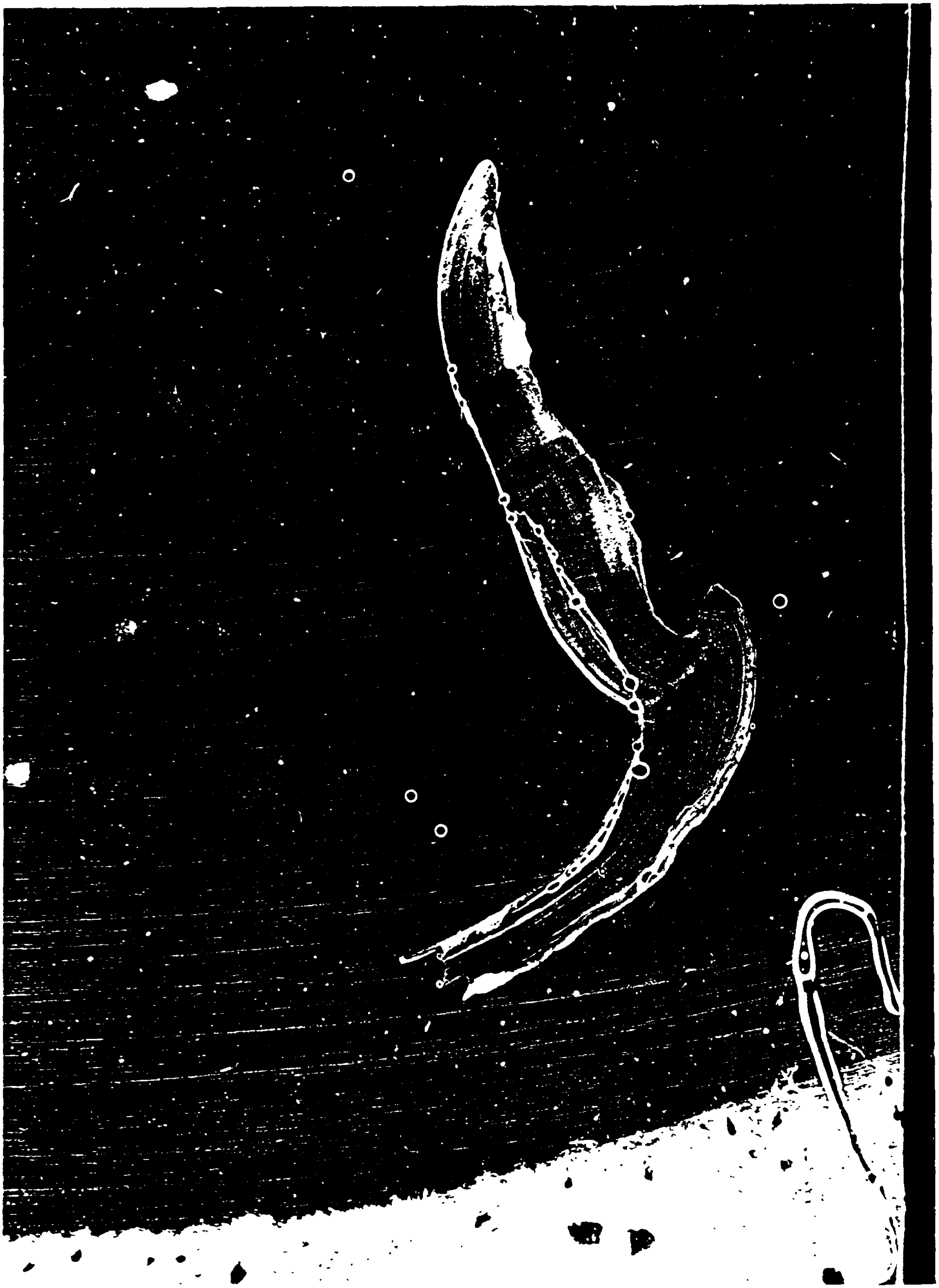
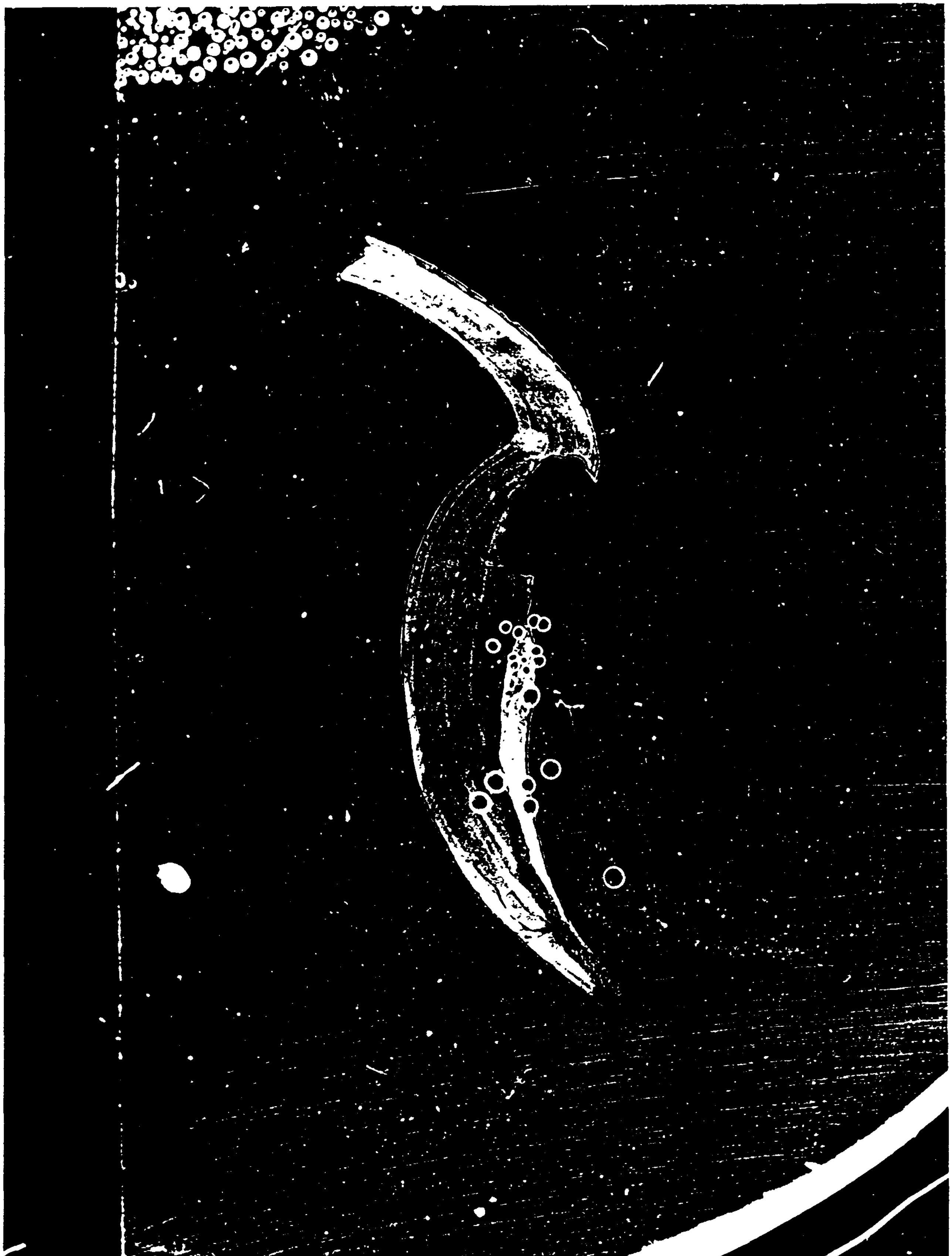


PLATE 7-2: Acetate peel of a soft-shelled clam chondrophore from the Weir site indicating cold season shellfish exploitation.



winter/spring. Plate 7-2 shows the acetate peel from specimen 5:10I. This clam was harvested during the formation of the slow growth annulus, and indicates late winter seasonality.

Rojo (1987) analyzed the growth increments of cod vertebrae from the Gooseberry Point site. His method involved observing inferred warm and cold season growth rings on the surfaces of the vertebral centra. Rojo interprets the Gooseberry Point vertebrae as indicating both warm and cold season cod fishing.

If Rojo's interpretation is valid, it poses a major interpretive problem since it conflicts with expectations based on both the natural history and ethnohistoric information about codfishing, and contradicts previous interpretations of archaeological cod fish assemblages in the Maine/Maritimes area (e.g. Black 1983:148-150; Sanger 1982:202). However, information presented by Carlson (1988) and Spiess (1988:p.c.) suggests that Rojo's methodology is faulty and may have yielded spurious results. They have found that the grooves and ridges on the surfaces of cod vertebral centra do not coincide with the warm and cold season growth bands visible within cod vertebrae. They suggest that only in exceptional circumstances are cod vertebrae well enough preserved to allow seasonality interpretation through examination of the vertebral surfaces.8

Since the faunal assemblages found in Maine shell middens are often similar to those found in Maritimes shell middens, seasonality patterns identified by growth increment analyses in Maine may be applicable to the Bliss Islands fauna. For example, Spiess and Hedden (1983:102) report evidence for summer white-tailed deer hunting, autumn moose hunting, and summer harbour seal exploitation at the Kidder Point site. Soft-shelled clams were harvested during spring and summer at Kidder Point, and there is evidence that spring harvested clams are associated with living floors, while summer harvested clams are restricted to two pit features (Spiess and Hedden 1983:106-107). Hancock (1982:55-56) found evidence for warm and cold season clam gathering, and possibly year-round occupation, by sectioning clams from sites in the Boothbay area.

Duration of Bliss Islands economic seasons:

Table 7-4 summarizes my inferences concerning the duration of Bliss Islands economic seasons. Gathering infaunal invertebrates (economic season #1) and epifaunal invertebrates (economic season #2) could have been practiced with equal probability at any time of the year. These pursuits are considered high probability subsistence activities in all seasons.

Fishing was probably a warm season activity. Small fish (#3) are more likely to have been captured in late summer and early autumn. Large fish (#4) could have been captured throughout the summer and early autumn.

TABLE 7-4: Inferred duration of Bliss Islands prehistoric economic seasons.

Economic Seasons:	resource:	Period of Exploitation: Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.
1)	infaunal invertebrates	======	======	======	======	======	======	======	======	======	======	======	======
2)	epifaunal invertebrates	======	======	======	======	======	======	======	======	======	======	======	======
3)	small fish			------	------	------	======	======	======	======	------	------	
4)	large fish			------	======	======	======	======	======	======	------	------	
5)	terrestrial birds	------	------	------	------	------	------	------	------	------	------	------	------
6)	shorebirds	======	======	======	------	------	------	------	------	------	------	======	======
7)	migratory birds			======	======	======	======	======	======	======	======	------	------
8)	seamammals	------	------	------	======	======	======	======	======	======	------	------	------
9)	artiodactyls	======	------	------	------	------	------	------	------	------	======	======	======
10)	small furbearers	------	------	------	------	------	------	------	------	------	======	======	======
11)	large furbearers	------	------	------	------	------	------	------	------	------	======	======	======
12)	domestic dogs	------	------	------	------	------	------	------	------	------	------	------	------

Key:

======	most probable duration
------	less probable duration
blank	improbable

Terrestrial birds (#5) could have been exploited at any time during the year; they are considered a low probability resource in all seasons. Shorebirds and raptors (#6) could also have been taken at any time during the year, but winter exploitation of this resource is somewhat more probable. Exploitation of migratory birds (#7) probably took place in the warm seasons from March to October, but might also have taken place in early winter. Sea mammals and terrestrial mammals could have been hunted at any time during the year. However, sea mammals (#8) were probably hunted during the warm seasons, although some winter hunting of grey seals seems to have taken place. Cervids (#9) were most likely hunted during the late autumn and winter, and furbearers (#10 and #11) during the late autumn and early winter. Dogs (#12) are considered a low probability food resource available throughout the year.

Seasonality of the Bliss Islands analytical units:

The inferred seasons of occupation represented by the Bliss Islands analytical units are summarized in Table 7-5. These interpretations are briefly discussed in this section.

Early Maritime Woodland occupations at the Weir site took place during the warm seasons, with the May-September period being the most probable. This interpretation is based primarily on the fish remains.

TABLE 7-5: Inferred seasonality of Bliss Islands analytical units.

Analytical	Unit:	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.
						Period of Occupation:							
Weir	stratigraphic component 1:				------	======	======	======	======	======	------	------	
	stratigraphic component 2:	======	======	======	------				------	======	======	======	======
	stratigraphic component 3:	======	======	======	------				------	======	======	======	======
	stratigraphic component 4:						------	------	======	======	======	======	------
Camp	layer 2:	------					------	------	======	======	======	======	------
	layer 3:	------					------	------	======	======	======	======	------
Northeast Point:	--												
Lighthouse Cove:	--			------	======	======	======	======	======	------			
Pintlowes Cove:	--			------	------	------	------	------	======	======	======	------	
Ledge Site:	--							------	======	======	------		

Key:

======	most probable season of occupation
------	less probable season of occupation
blank	occupation improbable/no information

Middle Maritime Woodland occupations at Weir probably took place predominantly during autumn and winter, although late summer and spring occupations cannot be completely ruled out. There is no evidence for mid-summer occupation, but the wide range of seasonality indicated is consistent with either short term occupations in all seasons or year-round occupation. The interpretation for stratigraphic component 2 is based primarily on the clam sections, and on the large fish, cervid and migratory bird remains. The interpretation for stratigraphic component 3 is based primarily on the sectioned grey seal teeth, the clam sections, and on the large fish, small fish, cervid and migratory bird remains.

Late Maritime Woodland occupations at Weir probably took place predominantly in late summer and autumn, although early summer and early winter occupations cannot be ruled out. Late winter and spring occupations are unlikely. These interpretations are based primarily on the harbour seal, large fish, small fish, migratory bird and small mammal remains.

The Late Maritime Woodland occupations at the Camp site appear to have taken place during the late summer and autumn, although mid-summer and winter occupations cannot be ruled out completely. Spring occupation is unlikely. Similar ranges of occupation are indicated for both layers 2 and 3. The interpretation for layer 2 is based primarily on the large fish, sea mammal, migratory bird, shorebird and bear remains. The interpretation for layer 3 is based primarily on the sectioned moose tooth, and on the large fish, cervid, migratory bird and shorebird remains.

There is no faunal information to bring to bear on the seasonality of the Northeast Point site. As discussed previously, the location and exposure of the site may suggest a warm season of occupation dating to the Late Maritime Woodland period. The conservative option is to ascribe seasonality to this site on the basis of its affinities to the Camp site and Weir site stratigraphic component 4. Another option is to ascribe seasonality through analogy with the other small sites. However, since the Northeast Point site may be functionally distinct from the shell middens, neither of these options are warranted.

The Lighthouse Cove site probably represents a warm season occupation during the Late Maritime Woodland period. This interpretation is based on the large fish and migratory bird remains.

The Pintlowes Cove site may represent an autumn occupation during the Late Maritime Woodland period. This interpretation is based on the migratory bird and mammal remains.

The Ledge site may represent a late summer or autumn occupation during the protohistoric period. This interpretation is based on the small fish and sea urchin remains.

Discussion and comparisons:

I hoped when I undertook the Bliss Islands research that one of the results would be a clarification of the controversy surrounding the season(s) of occupation of coastal sites in the Quoddy region. Unfortunately, the data presented here are neither extensive nor definitive enough to allow such a clarification. Nevertheless, some discussion and comparison of the data is warranted.

There are temporal trends discernable in the Bliss Islands seasonality information. Early Maritime Woodland occupations appear to have taken place in the summer/autumn seasons. There is evidence for a shift to autumn/winter/spring occupations during the Middle Maritime Woodland period, and occupation in all seasons cannot be ruled out. During the Late Maritime Woodland period, the evidence suggests late summer/autumn, and perhaps early winter occupations at the major sites and summer/autumn occupations at the small sites.

This pattern of seasonality changes through time is similar to the pattern detected at Partridge Island (Black 1983:157; Bishop and Black 1988:31), and, thus, appears to be a regional phenomenon. Moreover, information on prehistoric seasonality from central and northern Maine shell middens (e.g. Bourque 1973; Sanger 1988; Spiess et al. 1983:182) indicates a similar pattern of seasonality change, suggesting that the Bliss Islands data may reflect a consistent temporal trend in the seasonality of coastal occupation over a wide area and a considerable time range. In Maine, Late Archaic coastal components (especially Maritime Archaic) usually represent warm season occupations. The evidence for Susquehanna coastal occupations is unclear because of poor faunal preservation and because this culture seems to have been oriented toward the exploitation of terrestrial and riverine resources. Components dating between 2700bp and 2000bp tend to represent warm season occupations. Components dating from 2000-1000bp are usually cold season occupations, although there are indications of coastal occupation throughout the year. From 1000bp to the historic period evidence for summer occupation of the coast increases.

In general, in the Bliss Islands assemblages, the larger the faunal sample from a particular analytical unit, the wider the seasonal range inferred for that unit. This suggests that some of the variation in seasonality detected in this study may simply reflect variations in sample sizes.

To take a minimalist perspective on Bliss Islands seasonality for a moment, the most consistently indicated season of occupation in all of the Bliss Islands analytical units is late summer/autumn. This observation accords well with the prediction that prehistoric occupations in the insular Quoddy region would tend to take place in the season of highest productivity and when the weather is most settled. It also substantiates the prehistoric settlement model I previously postulated for the insular Quoddy region (Black 1983:158-160; Bishop and Black 1988:32-33): the central tendency in the settlement pattern is for insular occupations to have taken place during the warm seasons, and for mainland occupations to have taken place during the cold seasons. Finer resolution of the seasonality patterns of the insular Quoddy region will have to await more detailed stratigraphic subdivision of the faunal assemblages, and extensive growth increment analyses of several classes of faunal remains.

Notes:

1. I emphasize this point since tomcod are often considered good cold season indicators because of ethnohistoric references to a winter tomcod fishery. Sanger and Chase (1984) interpret tomcod in the Roque Island sites as cold season indicators. In contrast, Spiess et al. (1983:96) interpret tomcod as indicating late spring/early summer seasonality.

2. A project involving seasonality analysis of clams from the northern Passamaquoddy Bay sites has recently been initiated (Belcher 1988:p.c.).

3. I am currently conducting a seasonality analysis of clams, sea urchins, mammal teeth and vertebrate fish remains from the insular Quoddy region at the Dept. of Invertebrate Zoology, Royal Ontario Museum.

4. I hoped that sectioning beaver teeth would shed some light on the seasonality of beaver exploitation. Spiess (1988:p.c.) notes that beaver teeth are theoretically interpretable when sectioned, but that he personally has rarely obtained readable sections from archaeological specimens.

5. Spiess notes that mammal teeth are generally not well preserved histologically in Northeastern shell middens; the Bliss Islands specimens are not unusual in this respect.

6. The information presented in this section should be qualified by noting that the growth increment data from the Bliss Islands were interpreted by analogy with modern faunal specimens from Maine. Ideally, modern specimens from the Quoddy region should be used as analogues. Local variations in seasonal growth patterns can be significant over relatively short distances. For example, Spiess and Hedden (1983:204) found that annulus formation in clams from the Penobscot estuary is ca. 1 month later than in clams from the Damariscotta estuary. The position of the clam in the intertidal stratigraphy also apparently affects the timing of annulus formation (Belcher 1988:p.c.).

7. Spiess (1987:p.c.) notes that, in the large samples of clams from Maine middens that he has sectioned, about 33% of the clams are uninterpretable because their growth records lack year to year consistency. Thus, the width of the final growth annulus can be expected to yield spurious interpretations in about 33% of cases. To partially compensate for this, I have classified the specimens according to a two season model using a slow (cold season), fast (warm season) growth distinction (cf. Claassen 1986).

8. Spiess (1988:p.c.) notes that visible grooves and ridges on the surfaces of fresh cod vertebrae do not coincide with internal layers of translucent and opaque bone corresponding to warm and cold season growth bands. In shell middens, cod vertebrae become completely opaque so that only the grooves and ridges of archaeological vertebrae are visible, not the growth bands. However, archaeological cod vertebrae often crack into concentric rings running around the vertebral face. These rings apparently do follow the seasonal growth bands and allow seasonality inferences in exceptional circumstances. Cod vertebrae are the most common fish elements preserved in many sites on the Northeast coast; unfortunately they are also frequently the most poorly preserved fish vertebrae.

****

LIVING CLOSE TO THE LEDGE

PART IV (continuity)

Blank page inserted to maintain continuity.

CHAPTER 8:

SUMMARY, CONCLUSIONS, SPECULATIONS AND IMPLICATIONS.

> "Like water on a hot griddle, I have bounced around, but the unification of the thesis is at hand" (Harlan Ellison in Why The Dinosaurs Died...).

I set out in this dissertation to: i) develop models of prehistory and human ecology for the Bliss Islands and the insular Quoddy region, ii) to address issues relating to the excavation and analysis of Northeastern shell middens, and iii) to address issues relating to the human ecology of coastally adapted hunter-gatherers. This final chapter is composed of three parts. In the first I present a summary in narrative form of the cultural history and human ecology models I have developed for the Bliss Islands. In the second part of the chapter I speculate about the cultural and natural processes that may have operated to produce the cultural changes documented in the study. In the third I discuss the implications of the Bliss Islands research for our understanding of prehistory and human ecology in the Quoddy region, for excavation and analytical strategies used in Northeastern shell middens, and for studying the human ecology of maritime adapted prehistoric hunter-gatherers in the Northeast.

Summary and Conclusions:

The earliest inhabitants of the Bliss Islands of whom we have definite evidence occupied the islands between ca. 2100bp and ca. 2400bp. There is good evidence for occupation at the Weir site and some evidence for cultural activity at the Camp site during this period. Since these are the two prime habitation sites on the Bliss Islands, in terms of the criteria that prehistoric people generally applied in selecting habitation sites in the Maine/Maritimes area, it is not surprising that these are the earliest and most consistently occupied locations.

The islands were almost certainly occupied earlier than this, by Maritime Archaic people, since evidence from Maine indicates that nearshore island occupations were part of the Maritime Archaic settlement pattern. Furthermore, artifacts found offshore in the Quoddy region suggest that the region, including offshore islands, has been occupied since ca. 6000bp.

The earliest people detected on the Bliss Islands were part of an Early Maritime Woodland culture that developed locally from roots in the Late Archaic cultures of the area, particularly Maritime Archaic and Susquehanna. The cultural history of the Maine/Maritimes area, during the period from the end of Susquehanna at ca. 3400bp to the earliest cultural evidence from the Quoddy region at ca. 2500bp, is enigmatic. In the Quoddy region evidence from this transitional period has largely been lost due to coastal erosion. However, one event of considerable archaeological significance took place--the introduction of ceramic technology. This introduction was part of cultural influences on the people of the Maine/Maritimes area stemming from the southern and interior parts of the Northeast, and involving first the Meadowood and later the Adena complexes.

The Early Maritime Woodland people on the Bliss Islands used a variety of stemmed 'projectile points', most of which may actually have functioned as knife blades. The lithic materials they employed were predominantly locally obtainable volcanic and metamorphic rocks. The exotic lithics they used were also volcanics, and suggest relationships with their neighbors to the south. They also made ceramics; the small amounts recovered indicate either that this was not a particularly important technology at the time, or that the occupations detected on the Bliss Islands were too brief for significant amounts of broken ceramics to accumulate.

There is no reason to equate the presence of projectile points in coastal assemblages with large land mammal hunting. In fact, there is a small amount of evidence that Early Maritime Woodland people hunted deer on the Bliss Islands; however, the bulk of the faunal evidence from the Weir site indicates that they were strongly oriented toward the exploitation of marine resources, principally large vertebrate fish and shellfish. This adaptation is reflected in artifacts such as the bone harpoon point and the notched line weight. Only the warm season portion of the Early Maritime Woodland seasonal round is represented in the Weir site assemblage.

Early Maritime Woodland people occupied the Camp and Weir sites periodically but simultaneously; however, the two sites were functionally different. They used the Camp site mainly as a habitation site, while the Weir site served them mainly as a marine resource exploitation and processing site. The place of the Camp site in their subsistence activities and seasonal round is unclear because no faunal remains from the site can be definitely associated with occupations dating to this period; this is because shellfish were not harvested and deposited at the Camp site at this time.

The next temporal division in Bliss Islands cultural history, the Middle Maritime Woodland period, is differentiated from the Early Maritime Woodland on the basis of observed differences in artifact assemblages and stratification at the Weir site, and inferred differences in the subsistence and seasonality patterns of Middle Maritime Woodland people. Again, most of the evidence for occupation is from the Weir site, but there is some evidence for cultural activity at the Camp site as well.

Middle Maritime Woodland people continued to use the Weir site primarily as a place for harvesting and processing marine resources; the Camp site was again used as a habitation area.

Subsistence activities at this time were both more intensive (as evidenced by the large shell deposits and higher vertebrate MNI counts) and broader based (as evidenced by a wider range of prey species) than those of their Early Maritime Woodland predecessors. In addition to shellfish and large vertebrate fish, small vertebrate fish, seals, deer and a variety of birds were exploited. Although large mammals were hunted, no projectile or harpoon points have been found from this time period. Surprisingly, vertebrate fish seem to have been less important to subsistence than earlier, and no evidence for fishing gear has been found. Apparently, Middle Maritime Woodland people procured vertebrate fish as a relatively casual part of a littoral gathering adaptation focussed on shellfish.

These people occupied the islands during both the warm and cold seasons, and may have lived on the islands year-round, although most of the faunal remains at the Weir site result from cold season occupations. They exploited particular resources at particular points in time, for example, shellfish in the late autumn, winter and spring, vertebrate fish during the autumn, deer during the winter, grey seals during their mid-winter molting and pupping season, and harbour seals during their early summer molting and pupping season.

The clarity of the stratification at Weir, the striking differences between clam and mussel shell layers and clam and sea urchin shell layers, the relatively unfragmented shell deposits, the clustering of particular types of vertebrate faunal remains, and the remains of particular faunal individuals, in particular layers or on particular layer interfaces, all indicate discrete episodes of resource exploitation at the site, but not continuous occupation. Unfortunately, it is not clear how these exploitation patterns fit into the annual subsistence patterns of the Middle Maritime Woodland people. The substantial living floors and occupation layers constructed and deposited at Weir during this period result from relatively short periods of intensive exploitation of marine resources. Most summer harvested vertebrate resources may have been deposited at the Camp site, where they were not preserved. Again, during this period, there is no evidence that people harvested shellfish at Camp.

The Middle Maritime Woodland people used local lithic materials, mostly volcanics, and left little evidence of stone working. The most common artifacts they left in the sites are sherds of thick walled, dentate stamped ceramic vessels. A few bone awls, modified beaver incisors and modified scallop shells show that they made some tools from organic materials.

Neither the Early nor the Middle Maritime Woodland assemblages at the Weir site appear to represent the entire artifactual inventories of these people.[1] Artifacts from these time periods, especially lithic artifacts and debitage, organic tools and bone working debris, are very sparse in comparison to the large amounts of faunal remains present. While many resources were undoubtedly harvested using technologies that are not directly represented in the archaeological record, it is probable that other aspects of the Early and Middle Maritime Woodland settlement systems, perhaps involving non-shell midden counterparts to the occupations at Weir, may exist or have existed. Some of these 'other' Early and Middle Maritime Woodland occupations took place at the Camp site; others may have taken place at sites on the islands that have either not been found or are completely eroded away, or at sites elsewhere in the Quoddy region.

The time period from ca. 1550bp to ca. 550bp is referred to as the Late Maritime Woodland. The beginning of this period was a time of relatively rapid cultural change on the Bliss Islands, although the changes in artifact assemblages may have occurred more gradually than they appear in the archaeological record. In contrast to the earlier artifact assemblages, those from the early Late Maritime Woodland period appear to contain entire artifactual inventories.

People living on the Bliss Islands after ca. 1600bp used both bifacial and bipolar reduction techniques; their habitation sites are littered with large amounts of lithic artifacts and debitage. Locally available quartz and exotic cherts replaced volcanics as the preferred lithic materials; exotic lithic materials were used in significant amounts. A wide range of organic artifacts were made, including barbed bone points, small bone awls and eyed needles. Beaver incisor artifacts were used very frequently, but incisors were less extensively modified than in earlier times. Ceramic vessels were decorated with loosely spaced rocker dentate decorations. By ca. 1200bp Late Maritime Woodland people had begun to make shell tempered pottery, and to decorate their pots using cord wrapped stick impressions.

The earlier part of the Late Maritime Woodland period (ca. 1550bp--ca. 1100bp) is represented by substantial cultural components and assemblages on the Bliss Islands. From ca. 1550bp to ca. 1200bp the focus of occupation on the Bliss Islands appears to have shifted from the Weir site to the Camp site. From ca. 1200bp to 1100bp and perhaps later, occupation was again centered at the Weir site. However, marine resource exploitation may have continued at the Weir site throughout the 1550bp--1100bp period. There were also short term occupations of an apparently more specialized nature at other sites, such as Northeast Point.

Late Maritime Woodland people exploited terrestrial mammals and birds much more frequently than their predecessors. There is evidence for an increasing range of species being exploited from the later part of the Middle Maritime Woodland through the early part of the Late Maritime Woodland. This pattern may reflect either an actual broadening of the ecological niche being exploited, changes in the seasonality of coastal exploitation, or both.

The settlement pattern represented by the Late Maritime Woodland components is enigmatic due to disturbance of the deposits by natural and cultural processes. Living floors and features are less substantial than those of the earlier occupations, and faunal remains indicate mainly warm season occupations. Components such as the Lighthouse Cove and Pintlowes Cove are much smaller and may represent sporadic short term visits to the islands.

There is no compelling evidence for occupation of the Bliss Islands during the later part of the Late Maritime Woodland period from ca. 1000bp to ca. 550bp. However, there is evidence for occupation during the protohistoric period. Protohistoric people probably occupied Camp as a habitation site; however, marine resources were exploited at the Ledge site rather than at Weir during this period. By this time, Weir was probably covered by peat soil and coniferous forest and was unattractive as either a habitation or exploitation site.

Speculations:

Documenting a series of changes in the archaeological record is a relatively simple matter compared to explaining these changes in cultural terms. The information presented in this study suggests several processes that may have operated to produce culture change in the Quoddy region during the past 2500 years. My brief discussion of these processes is speculative, and is intended to suggest directions in which future research in the Quoddy region and the Maine/Maritimes area should be directed.

Ecological models indicate that the pattern of subsistence change I have detected in the Bliss Islands assemblages--the intensification of resource exploitation and the increasing range of resources exploited--is a predictable result of increasing population density through time (Earle 1980:21; Christenson 1980:34), although changes in Quoddy region subsistence patterns may also reflect changes in the season of coastal occupation. The high density of cultural materials deposited in components dating from the Middle Maritime Woodland period through the early part of the Late Maritime Woodland period may also indicate increasing population density. This interpretation is difficult to reconcile with the small number of components from the later part of the Late Maritime Woodland and from the protohistoric period, and with the small population recorded in the Quoddy region at European contact (cf. Snow 1980:36; Turnbull and Allen 1988:255). The possibility of significant fluctuations in human population density in the Quoddy region during the prehistoric period should receive further consideration.

The proliferation of sites and components in the Late Maritime Woodland, especially small sites in locations different from the large multi-component shell middens, the more ephemeral nature of living floors and features, and the evidence for trade in exotic lithic materials, suggest that people inhabiting the Quoddy region at this time were increasingly mobile. These changes co-occur with the appearance of a different tool kit from that found during the Early and Middle Maritime Woodland occupations. The Late Maritime Woodland tool kit is composed of numerous awls, needles, modified rodent incisors, small scrapers, utilized flakes and, more rarely, small ground stone axe/adzes. The functions of many of these tool types are unknown, but attempts could be made to ascertain these through use wear and residue analyses.

I suggest that the Late Maritime Woodland tool kit reflects a technological emphasis on light wood working, bark working and basketry making, and that the appearance of this tool kit in the archaeological record indicates the adoption, or perhaps merely the intensification, of bark working and basketry technologies. These technologies were salient features of native culture in the Maine/Maritimes area during the ethnographic period (Snow 1980:47; Wallis and Wallis 1957).

Two phenomena observed in the archaeological record may be explainable as consequences of these technologies. An emphasis on bark and basketry containers may partly account for the gradual de-emphasis of ceramic technology in the Maine/Maritimes area (cf. Snow 1980:290). Also, given that the Late Maritime Woodland components do indicate greater population mobility, this may be attributable to the use of birch bark canoes.

Birch bark canoes were used by native people in the Quoddy region during the historic period (Sanger 1987:118-121; Snow 1980:51). However, the history of the birch bark canoe is unknown, and the types of watercraft used during the prehistoric period can only be inferred indirectly. Sanger (1988:91) infers a long history of development for the birch bark canoe on the Northeast coast because of the differentiation of canoe types by function and ethnic group. Snow (1980:85,198,209) suggests that large dugout canoes were used in estuarine and seagoing contexts during the Late Archaic. The emphasis on heavy wood working tools in Archaic and some later assemblages may reflect dugout canoe manufacturing (Snow 1980:134). Dugouts continued to be made and used at least occasionally in the Maine/Maritimes area until the historic period (e.g. Lescarbot 1928:247). The possibility that the development of birch bark canoes, or perhaps the adoption of their use in estuarine and seagoing contexts, was a relatively late event in the prehistory of the Maine/Maritimes area is one that should be considered.

Sanger (1988:91) has argued convincingly for the advantages of using light weight water craft such as birch bark canoes rather than dugouts in the Quoddy region, where the tidal range is high and the intertidal zones are extensive and often at steep gradients. Bark and basketry containers would also be more convenient than heavier and more fragile ceramic containers for seagoing hunter-gatherers in this environment.

A third factor, and perhaps a major driving force behind the Late Maritime Woodland adaptive strategy in the Quoddy region, may have been environmental change in the form of fluctuating rates of sea level rise. Sanger (1985a) has presented evidence for a slowing in the rate of sea level rise on the Maine/Maritimes coast at ca. 2500bp. He infers that the resulting hiatus in shoreline change allowed the development and preservation of large coastal middens. A hiatus in sea level rise would have allowed the development of extensive and productive intertidal zones, and perhaps more crucial for human behaviour, would have meant that the same places remained productive as long as sea levels remained relatively stable. This may have meant an overall rise in the productivity and predictability of shellfish resources in the area. These conditions would have presented an opportunity for prehistoric people to intensify their exploitation of shellfish, which, in turn, would have contributed to the development of large coastal middens.

On the Northeast coast generally, this slower rate of sea level rise has prevailed until the present. Thus, on the central Maine coast, Kellogg and Sanger (1984) are able to argue that most of the shell middens deposited during the past 2500 years are at least partially extant. However, Sanger (1987:63) notes that the rate of sea level rise in the Quoddy region must have increased dramatically in the past few centuries. The rapid rate of rise (currently ca. 9cm/century in some places) is a localized phenomenon resulting from crustal downwarping in the Quoddy region and increasing tidal amplitude in the Bay of Fundy. No timetable has been suggested for the change from slow to rapid rates of rise in the Quoddy region. Based on my observations of the archaeological record in the insular Quoddy region, I present the following as a possible scenario for this phenomenon.

The rate of sea level rise remained slow from ca. 2500bp to ca. 1600bp, allowing the accumulation of the substantial shell deposits noted in Early and Middle Maritime Woodland components. At ca. 1600bp the rate of rise began to increase, but the increase was gradual rather than dramatic. The rate of sea level rise has accelerated gradually from then until the present.

The consequences of rising sea levels would have been a gradual reduction in the productivity of shellfish resources, and increasing variability in resource location, as intertidal zones fluctuated in response to coastal erosion and changing shorelines (cf. Sanger 1987:78-83). Prehistoric people may have responded to these conditions with increased mobility, a broadening of their subsistence base, and ultimately by less dependence on shellfishing. These behaviors are reflected in the archaeological record by smaller components resulting from shorter periods of occupation, the deposition of sites containing smaller amounts of shellfish remains and larger amounts of other types of organic debris, a wider variety of fauna in archaeological assemblages, and greater variability in the locations of sites.

Finally, historical and sociological phenomena have played a role in cultural change in the Quoddy region. Recent archaeological research in the Newfoundland/Labrador area indicates that lithic assemblages similar to those I have interpreted as characterizing the Late Maritime Woodland period in the Quoddy region, appear in Newfoundland and Labrador at about the same time. There, these assemblages are part of the Daniel Rattle complex (ca. 1750bp-ca. 1000bp) and the succeeding Point Revenge complex (ca. 1000bp-historic) (Loring 1987, in press). Distributions of lithic materials from known sources (especially Ramah chert from Labrador and Nova Scotia cherts and chalcedonies) indicate that, during the Late Maritime Woodland period, people living in the Quoddy region may have participated in an exchange system involving groups from central Maine north to northern Labrador. While exotic lithics are the best archaeological indicators of this system, beaver pelts (Spiess et al. 1983:100-101), and birch bark (Loring in press) may also have been exchange commodities. I have argued above that the Late Maritime Woodland tool kit represents, in part, bark working technology; at one site in Newfoundland, a similar lithic assemblage is definitely associated with preserved birch bark, apparently laid out in preparation for canoe construction (Austin 1981).

Loring (1987:50-51) proposes that maritime adaptations may restrict social relationships by linearizing spatial arrangements between neighboring groups. He suggests that formal exchange systems may develop as a way of facilitating access to marriage partners and other resources in this type of spatial arrangement. This may be an important consideration for interpreting the prehistory of the Northeast coast.

During the Maritime Archaic period strongly maritime oriented subsistence patterns developed on the Northeast coast. At the same time there is evidence for exchange, social interaction and similarities in material culture from central Maine north to Labrador.

In the Terminal Archaic and Early Woodland periods, with the incursion of ideas and probably people from southern New England and the interior Northeast, a more terrestrial and riverine oriented subsistence pattern was adopted in the Maine/Maritimes area (Spiess et al. 1983:97-98). Kirch (1980) suggests that cultural behaviour can be expected to be variable during periods of changing adaptations. This may explain why archaeological evidence from the Terminal Archaic and Early Woodland periods in the Maine/Maritimes area has been difficult to interpret. Spiess and Hedden (1983:186) describe themselves and other archaeologists in the Northeast as proverbial blind men grasping various parts of a metaphorical Early Woodland elephant without having any overall feel for the nature of the beast.

The outcome of this period of change was that, by the Middle Maritime Woodland period, a strongly maritime oriented subsistence pattern had again become established on the Northeast coast. In the Quoddy region, the Middle Maritime Woodland may have been a period of relative cultural isolation from other parts of the Northeast. By ca. 1550bp, this adaptation may have led, as Loring suggests, to a restriction of social relationships along the coast that necessitated formal social and exchange institutions to tie disparate groups together.

These institutions may have taken the form of regional exchange systems, centered on particular sources of lithic materials and other resources, that operated most intensively at relatively short distances, but which came in contact frequently enough for exchange items and information to be shared throughout the whole of the northern Northeast coast. For example, Late Maritime Woodland people in the Quoddy region may have been part of an exchange system operating in the Bay of Fundy, one focus of which was the chert sources at Scott's Bay, Nova Scotia. Once again, as in the Late Archaic period, the coastal Northeast from central Maine to Labrador was tied together socially and economically.

These interpretations suggest that a series of interactions took place in the Maine/Maritimes area between historic events and ecological constraints during the prehistoric period, and that, on more than one occasion, these resulted in similar human adaptive responses. The vast amount of archaeological information about the prehistory of the Northeast coast that has accumulated in the past two decades may be complete enough to allow archaeologists to begin testing wide ranging models of cultural development and interaction. I believe that the coastal 'far northeast' represents a valuable natural laboratory in which demographic, technological, ecological and sociological models of maritime adaptations among prehistoric hunter-gatherers can be developed.

Implications:

Implications for the prehistory and human ecology of the Quoddy region

The results of the Bliss Islands project indicate that investigating site clusters rather than individual sites and functional and well as temporal relationships between sites has the potential to significantly alter our impressions of prehistoric human ecology in the Quoddy region. In this study I have pursued cultural history as a temporal framework within which to understand the human ecology of the Quoddy region rather than as an end in itself. In substantive terms, I have suggested only minor revisions to extant conceptions of the dating of diagnostic artifacts in Quoddy region archaeological assemblages. However, with regard to terminology, the cultural history model I have presented here runs counter to some trends which have dominated cultural history research in the Quoddy region and the Maine/Maritimes area over the past several decades; as a result, the model will undoubtedly prove controversial. I present it as an initial 'chronological approach to the cultural history of the Ceramic Period' (in Turnbull and Allen's [1988:253] words), and as a model to be tested, not as the definitive treatment of Quoddy region, or even Bliss Islands, cultural history.

The strengths of the model are that: i) the terminology used emphasizes both the distinctiveness of the Maine/Maritimes area during prehistory and continuity between the Maine/Maritimes and other areas of northeastern North America; ii) it identifies major cultural transitions in the Maine/Maritimes area as occurring at approximately the same times that cultural transitions took place elsewhere in the Northeast; iii) it is based on local evidence from stratified sites, rather than on imported cultural history models; iv) it is based on a radiocarbon chronology that can largely be demonstrated to be internally consistent; and v) like any good heuristic device, the model raises more questions than it answers. Some weaknesses of the model are that: i) it is based on small samples of artifacts, and small areas of excavation; ii) it requires more detailed examination and dating of diagnostic artifact types than have been undertaken in the present study; and iii) the relationships between the Maritime Woodland and Archaic periods, on one hand, and the Maritime Woodland and protohistoric periods, on the other, remain poorly developed.

It is probably premature to criticize Sanger's formulation of the Quoddy Tradition in detail prior to the publication of his definitive statement concerning it (see Sanger 1987:155). However, much of the information derived from the Bliss Islands study is directly relevant to the Quoddy Tradition model, and a few preliminary comments are warranted. At the level of terminology, I object to the designation 'Quoddy Tradition' on two grounds. First is the matter of the geographic range to which the model applies. Does its designation as the **Quoddy** Tradition indicate that the model is intended to apply to the Quoddy region exclusively? Is intended to apply to both the insular and mainland portions of the region? Can it be extended to adjacent parts of Maine and the Maritimes as well?

These are empirical matters that can be clarified through further research and comparative analyses. However, it is noteworthy that both Sanger (1987:132-134) and Cox (1987:20) suggest there are significant differences between assemblages from the Quoddy region sites and those from sites in the adjacent parts of northern Maine.

My second objection is to the designation of the Quoddy Tradition as a **tradition**. This is not so much a criticism of Sanger's formulation as it is a criticism of archaeological terminology. There has been a lamentable tendency for archaeologists to use the term tradition as a synonym for adaptation (as a noun) (e.g. Goggin 1949:17; Hester and Grady 1982:85-86; Wright 1966:14-15; Snow 1980:17-18), in spite of Willey and Phillips's (1958:37) attempt to restrict the archaeological use of tradition to designate 'temporal continuity represented by persistent configurations in single technologies or other systems of related forms'. Sanger refers to the Quoddy Tradition as a lifestyle; it is apparent that he is talking about an integrated adaptation, not a single technology. Adaptation is an ecological concept with a long history of use in anthropology (Alland 1975) and archaeology (Kirch 1980); there is no justification for using tradition as an archaeological euphemism for adaptation (cf. Snow 1980:190).

The artifactual assemblages from the Bliss Islands suggest that more than one technological tradition (in Willey and Phillips terms) existed in the Quoddy region during the Maritime Woodland period. The faunal data from the islands contradict Sanger's model of a stable and generalized prehistoric adaptation to the region throughout this period. There is evidence for significant changes in three cultural phenomena, technology, subsistence economy, and settlement patterns, during the 2000 year period (ca.

2400bp-ca. 350bp) addressed by the Bliss Islands study. However, if adaptation is seen as a 'process of change' rather than a 'state of being' (cf. Kirch 1980:103), it may be possible to consider the human ecology information from the Quoddy region as reflecting a single adaptation, especially if the historical and ecological factors impinging on this 'process of change' can be explicated.

The Bliss Islands site inventory shows that archaeological sites in the Quoddy region were functionally specialized in terms of the subsistence practices and other activities conducted at them. Some of the contrasts noted are between shell rich and shell poor middens, between shell middens and non-shell cultural deposits, between artifactual assemblages predominated by ceramics and those predominated by lithics, between sites with high densities of artifacts and those with low densities, between assemblages consisting mainly of finished artifacts apparently manufactured elsewhere and those containing finished and unfinished artifacts and large amounts of debitage.

The functional contrasts noted in the Bliss Islands study were probably not recognised in previous interpretations of Quoddy region prehistory for two reasons: i) because earlier interpretations were mainly based on a single site type--large mainland shell middens containing both historic and prehistoric assemblages, and which were either 'unstratified' or mixed by historic disturbances (Black 1988f); and ii) as a result, there are problems in correlating different types of deposits (e.g. shell layers vs. house-pits) in these sites (see McCormick 1980:80-110). These factors have been a serious impediment to discerning culture change in the Quoddy region. The high density of artifacts in Late Maritime Woodland components, compared to the earlier components, has probably contributed to non-recognition of the latter, because in mixed sites where several components were excavated as a single assemblage, the Late Maritime Woodland artifacts would predominate so much that they give the impression of a single technological tradition spanning the entire time range represented at the site. Thus, I suggest that, while Sanger's model of the Quoddy Tradition may be largely valid for the Late Maritime Woodland period, it does not reflect cultural patterns in the Early and Middle Maritime Woodland periods.

I suggest that the Bliss Islands subsistence/settlement data can be accounted for using a model patterned after Bruce Bourque's analysis of the Turner Farm site/Fox Island thoroughfare area of the Penobscot estuary on the central Maine coast (see Spiess and Hedden 1983; Spiess et al. 1983).2 Bourque has found that all of the 'Ceramic Period' occupations at Turner Farm were multi-seasonal in nature (year-round or a series of random short term seasonal occupations), while faunal assemblages from other sites on Fox Island are more specialized. He postulates that the Fox Island thoroughfare provided a year-round focus for settlement, while occupations on other areas of Fox Island were seasonally or functionally specialized.

Similarly, the thoroughfare area between the Northeast and Central islands of the Bliss Islands group provided a focus for multi-seasonal occupation over a period of ca. 1500 years from the Early Maritime Woodland period through the early part of the Late Maritime Woodland period. Prehistoric people were attracted to the islands by the presence of an sheltered habitation area at the Camp site, by high marine resource productivity near the Weir site, and by easy boat landings and sheltered waters where, at that time, two coves opening in opposite directions adjoined on a narrow isthmus of land. The smaller sites on the Bliss Islands represent short term seasonally or functionally specific occupations related to the occupations at the major sites.

Throughout the prehistoric occupation of the Bliss Islands shellfish were the most consistently and intensively exploited resource. At the same time, there is a contrast between shell rich and shell poor components. To some extent this contrast represents a distinction between habitation and resource exploitation sites. However, evidence for warm season, especially summer, occupations tend to be most common in shell poor sites and components; in contrast, shell rich components contain convincing evidence for autumn/winter/spring seasonality. If the remains of most summer harvested vertebrates were disposed of in shell poor deposits, where they were less likely to be preserved, this may explain why evidence for warm season occupations has been difficult to detect in Quoddy region prehistoric faunal assemblages. These observations and explanations also suggest that year-round occupations of the insular Quoddy region may have taken place throughout the Maritime Woodland period.

I have not adopted Barber's specialized shellfish processing station model to account for the deposition pattern observed at the Weir site. However, Weir is apparently a place where shellfish were intensively exploited and processed over a considerable period of time. It seems likely that at least small scale preservation of shellfish and other food resources was conducted at the Weir site. Preserved food was probably transported at least as far as the habitation area at the Camp site.

Implications for the analysis of Northeastern shell middens

Recently, Sanger (1985b:3) has stated that, in his opinion, no Northeastern shell midden has ever been 'excavated entirely satisfactorily'. Nevertheless, during the past two decades, Northeastern archaeologists have developed many of the excavation strategies, analytical techniques, and even some of the theoretical models necessary for the comprehensive analyses of shell midden sites. However, only one, or at most a few of these techniques and models have been applied in any particular case study. A truly comprehensive study of a group of shell midden sites, or even of a single midden, would require a very long term committment and a daunting amount of work; such long term research projects are being conducted on the Northeast coast, but it will be some time before integrated and comprehensive results will be available from any of these projects.

I initiated the Bliss Islands Archaeology Project with the idea of developing it into such a long term project. Thus far, I have concentrated on two methodological aspects of shell midden archaeology most directly: i) stratigraphic analysis and the definition of meaningful units of analysis; and ii) methods for quantifying and interpreting anthropogenic invertebrate and associated vertebrate faunal assemblages. The implications of the Bliss Islands research for these issues are discussed below.

I have argued in this study that data from single component and distinctly stratified sites, used to produce a cultural history model based on local evidence, are crucial to expanding our understanding of the prehistory of the Quoddy region. Cultural remains recovered from shell middens must be related to depositional and/or stratigraphic sequences in order to be meaningful. I see the definition and sampling of temporally and culturally meaningful analytical units as a crucial first step in shell midden analysis, and one whose importance has often been glossed over because of misconceptions about the nature of shell midden contexts.

An excavation strategy employing large excavation blocks as the basic unit of sampling, small contiguous excavation units for horizontal proveniencing, and natural layer (or mixed natural layer/arbitrary level) units for vertical proveniencing, is optimal for maximizing recovery of samples of all archaeologically important materials and data from most types of shell midden contexts. Stratigraphic sequences must be developed, preferably using formal methods such as those developed by Harris (1979), and preferably in the field as part of the excavation process. Although Harris developed his methods for use in historic sites, they are easily applied to shell middens, because, like those in historic sites, most units of stratification in shell middens are largely anthropogenic. For accurate description of stratigraphic units and accurate quantification of their contents, a comprehensive column sampling strategy is imperative.

These techniques allow the archaeologist to construct a nested series of units of analysis; different units of analysis can be used to quantify different types of cultural materials (Black in press b). This method also allows the stratigraphic integrity of a particular site to be systematically evaluated.

Commenting on associations of cultural materials in shell middens, Sanger (1985b:3) states that:

> "The problem of what originally belongs with what is among the most critical facing the analyst working with shell middens, because it calls into question the commonly-held assumption that what is found together belongs together. It is almost reaching the point where the onus is now on the investigator to demonstrate the claimed association."

Based on the information I have presented in this study, I would counter this argument by inverting it: those who would dispute associations from single component and distinctly stratified multi-component sites should feel compelled to clearly delineate the alternate natural and/or cultural processes which they believe can account for observed associations. These alternate processes must be plausible in geomorphological and/or behavioral terms. In situations where there is clear evidence for stratigraphic separation of assemblages, or good evidence for the single component nature of a site, William of Occam's wonderful Razor can, and should, be invoked as the scientific principle behind accepting 'that what is found together belongs together'.

Significant vertical movements of artifacts and other cultural materials as a result of natural processes have only been demonstrated in loose fine sediments such as unconsolidated sand and in developing humic soil horizons (e.g. Cahen and Moeyersons 1977; Muckle 1985; Van Noten et al. 1980). They have never been demonstrated in shell matrices (Muckle 1985); in fact there is evidence that shell matrices resist mixing by both natural and cultural agents to a much greater degree than sand matrices (Hughes and Lampert 1977).

These considerations are directly reflected in the stratigraphy of the Weir site. During the Early and Middle Maritime Woodland occupations dense shell accumulations resisted mixing by people during the occupation of the site, and allowed rapid burial, vertical separation and excellent preservation of many of the materials they dropped onto site surfaces. Between occupations the shell deposits discouraged the growth of large plants, shrubs and trees on the site surfaces, which could potentially have disturbed site contents significantly. It is only at the transition between stratigraphic components 3 and 4, where a relatively long hiatus in occupation and shell deposition allowed the development of a substantial humic soil layer on the southern mound at the site, that natural pedogenic processes have disturbed the cultural contents of the upper layers of the shell midden and the black soil layer itself. Moreover, even at this interface considerable structural integrity remains in the site.

Similarly, the structure of the Ledge site shows that cultural stratification may be preserved for several centuries in even a shallow shell midden, in spite of the growth of trees over the site and the penetration of soil layers above and below the shell deposits by tree roots (Black 1988c:85).

In shallow Northeastern middens with low shell contents, natural and cultural disturbances neither result in an indecipherable mixture of remains nor justify excavation using completely arbitrary units of analysis. The prehistoric materials at the Camp site were deposited in an active soil layer and their spatial organization disturbed by natural pedogenic processes, and both prehistoric and historic cultural activity. Nevertheless, temporally meaningful vertical and horizontal spatial arrangements of cultural materials can be discerned in the site.

Implications for the study of maritime adapted hunter-gatherers

I have presented evidence suggesting that the subsistence economy of the native people inhabiting the Quoddy region was relatively specialized. This interpretation accords better with predictions from ecological theory than it does with predictions from ethnography. In part, the results of this study may reflect the likelihood that applying ecological methods will produce results that conform to ecological predictions. The most obvious alternative to these methods is to interpret the archaeological record by analogy to the practices of modern maritime adapted hunter-gatherers. My reasons for choosing ecological models over ethnographic analogies are as follows.

Ecologists study the adaptations of particular populations to specific sets of circumstances at particular points in time; their interests are in strategies and their approach is usually experimental and quantitative (e.g. Levins 1968). In applying ecological models to archaeological information, Christenson (1980) suggests that humans adapting to diverse and productive environments will adopt specialized subsistence strategies. Barber (1982) suggests that human populations will adopt specialized subsistence strategies where stable and predictable populations of locally unearned resources3 occur, as is often the case in the lower estuaries of major river systems.

Anthropologists generally adopt a more qualitative and typological approach to human subsistence. Predictions about subsistence adaptations based on hunter-gatherer ethnography are opposite to those derived from ecological theory--that humans adapting to diverse and productive environments will adopt generalized subsistence strategies. Archaeologists often adopt these generalizations as the basis for ethnographic analogies. For example, Hayden (1980:357) states that:

> "At high latitudes, where plant foods are exceedingly scarce, fishing and hunting must, by default, contribute more to the total diet... Among Arctic and Subarctic hunter/gatherers, animal foods are clearly the primary resource base, with mammals and fish providing as much as 90-100% of the total diet. This observation serves to distinguish between 'generalized' hunter/gatherers, who have access to many plant resources in temperate and

tropical zones, and 'specialized' hunter/gatherers, who exploit limited varieties of resources (mainly animals) in Arctic and Subarctic zones."

Hayden's statement reflects the confusion that often appears in the anthropological literature between degree of diversity in an environment and degree of specialization in the subsistence practices of hunter-gatherers occupying that environment. Similarly, and closer to the present study, Nash (1986:159) equates environmental diversity with generalized subsistence economy.

Ethnologists often assume a direct positive relationship between environmental diversity and human trophic niche breadth although this relationship has rarely been quantified by ethnographers. The qualitative impressions that ethnologists base their conclusions on have generally been gathered under looser ecological constraints and over longer time frames than those of ecologists. If a group of hunter-gatherers concentrates almost exclusively on particular prey species at specific times of the year, but during the course of the year exploits most of the prey species available in the environment, is the group's subsistence economy specialized or generalized? My impression is that most ethnologists would consider the behaviour of such a group as relatively generalized; however, a quantitative analysis of their subsistence production at any point in time would reveal it to be relatively specialized.

The crucial considerations for zooarchaeologists are: i) under what circumstances are models from ecology appropriate for interpreting archaeological data; and ii) whether, in any particular case, faunal assemblages represent events analogous to those reflected in ecological studies, or those reflected in ethnographic studies. Faunal assemblages from Northeastern shell middens (especially those from small sites, single component sites, and large sites that can be subdivided into culturally and temporally meaningful subassemblages) represent specific responses to specific sets of ecological circumstances over relatively short periods of time. Since the prehistoric people involved were relatively mobile hunter-gatherers, these assemblages probably rarely reflect a whole year of subsistence practices.

Thus, it is appropriate to apply ecological models and measurements, such as the niche width model used in this study, to Northeastern shell midden contexts. Indeed, I would argue that only by applying such models will inter-site and inter-regional comparisons of prehistoric subsistence be possible. Ecological models shift the focus from the particular species exploited to human behaviour with respect to particular types of resources. The crucial steps involved in applying ecological models to zooarchaeological assemblages are: i) defining meaningful units of analysis; and ii) ensuring that taphonomic factors are similar for each unit of analysis compared.

Shell middens provide excellent opportunities for applying ecological models because the taphonomic constraints operating in them are quite similar, and because they ensure better preservation of vertebrate faunal assemblages than is the case in many other types of prehistoric archaeological contexts. I believe that further subsistence studies of the type undertaken here will reveal that although, over the long term and at a large scale, they cast their nets fairly widely through their environment, prehistoric Northeasterners in highly productive maritime environments such as the Quoddy region used specific mesh sizes in specific seasons and at particular points in time.

Shell middens have long been regarded as problematic archaeological contexts. Too often, research designs for shell midden sites have been limited by preconceptions about their problematic nature, rather than being designed to exploit their strengths as archaeological contexts. Shell middens are not 'easy' sites to excavate and analyze. However, the 'problems' they present can be seen as a series of stratigraphic and zooarchaeological 'puzzles'. If appropriate methods are applied to these puzzles, it is precisely in the areas of component separation and subsistence pattern reconstruction that the great strengths of shell midden contexts become apparent.

Notes:

1. By 'entire artifactual inventories' I mean the range of artifacts one would expect to be used and discarded during an annual subsistence cycle, and to be preserved in the archaeological record under the prevailing taphonomic constraints.

2. A monograph describing the Turner Farm site will be available in the near future (Bourque 1989:p.c.).

3. 'Locally unearned resources' (see Birdsell 1968:231) are those prey species largely supported by food chains outside the area in which they are captured or supported by nutrients transported into the local food chain from other areas. Examples include migratory mammals, migratory birds, anadromous fish and shellfish.

Blank page inserted to maintain continuity.

REFERENCES CITED

Aikens, C.M., K.M. Ames and D. Sanger. 1986. AFFLUENT COLLECTORS AT THE EDGES OF EURASIA AND NORTH AMERICA: SOME COMPARISONS AND OBSERVATIONS ON THE EVOLUTION OF SOCIETY AMONG NORTH-TEMPERATE COASTAL HUNTER-GATHERERS. In T. Akazawa and C.M. Aikens (eds.), PREHISTORIC HUNTER-GATHERERS IN JAPAN--NEW RESEARCH METHOD. Tokyo: University of Tokyo Press.

Alland, A. 1975. ADAPTATION. Annual Review of Anthropology 4:59-73.

Allen, P.M. 1980. THE OXBOW SITE. In D.M. Shimabuku (ed.), PROCEEDINGS OF THE 1980 CONFERENCE ON THE FUTURE OF ARCHAEOLOGY IN THE MARITIME PROVINCES. St. Mary's University, Department of Anthropology, Occasional Papers #8.

Allen, P.M. 1981. THE OXBOW SITE: CHRONOLOGY AND PREHISTORY IN NORTHEASTERN NEW BRUNSWICK. New Brunswick Historical Resources Administration, Manuscripts in Archaeology 1.

Allen, P.M. in press. THE 1984 OXBOW ARCHAEOLOGY PROJECT. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology.

Ambrose, W.R. 1967. ARCHAEOLOGY AND SHELL MIDDENS. Archaeology and Physical Anthropology in Oceania 2(3):169-187.

Anderson, A.J. 1981. A MODEL OF PREHISTORIC COLLECTING ON THE ROCKY SHORE. Journal of Archaeological Science 8:109-120.

Austin, S.J. 1981. CAPE COVE BEACH (DhAi-5,6,7), NEWFOUNDLAND: PREHISTORIC CULTURES. M.A. thesis, Department of Anthropology, Memorial University of Newfoundland.

Bailey, G.N. 1975. THE ROLE OF SHELL MIDDENS IN PREHISTORIC ECONOMIES. PhD dissertation, Archaeology Department, Cambridge University.

Baird, S.F. 1881. NOTES ON ABORIGINAL SHELL MOUNDS ON THE COASTS OF NEW BRUNSWICK AND NEW ENGLAND. Proceedings of the U.S. National Museum 4:292-297.

Banfield, A.W.F. 1974. THE MAMMALS OF CANADA. Ottawa: Nature Canada.

Barber, R.J. 1982. THE WHEELER'S SITE: A SPECIALIZED SHELLFISH PROCESSING STATION ON THE MERRIMACK RIVER. Cambridge, Mass.: Harvard University.

Beck, B. 1983. THE GREY SEAL IN EASTERN CANADA. Ottawa: Fisheries and Oceans.

Bender, M.M. 1971. VARIATIONS IN THE 13C/12C RATIOS OF PLANTS IN RELATION TO THE PATHWAY OF PHYTOSYNTHETIC CARBON DIOXIDE FIXATION. Phytochemistry 10:1239-1244.

Bettinger, R.L. 1980. EXPLANATORY/PREDICTIVE MODELS OF HUNTER/GATHERER ADAPTATIONS. In M.B. Schiffer (ed.), ADVANCES IN ARCHAEOLOGICAL METHOD AND THEORY, vol. 3. New York: Academic Press.

Biard, P. 1959. RELATION OF NEW FRANCE OF ITS LANDS, NATURE OF THE COUNTRY AND OF ITS INHABITANTS. In R.G. Thwaites (ed.), THE JESUIT RELATIONS AND ALLIED DOCUMENTS. New York: Pageant Books.

Binford, L.R. 1981. BONES: ANCIENT MEN AND MODERN MYTHS. New York: Academic Press.

Birdsell, J.B. 1968. PREDICTIONS FOR THE PLEISTOCENE BASED ON EQUILIBRIUM SYSTEMS AMONG HUNTER-GATHERER. In R.B. Lee and I. Devore (eds.), MAN THE HUNTER. Chicago: Aldine.

Bishop, J.C. 1983a. THE PARTRIDGE ISLAND SITE: EARLY AND MIDDLE WOODLAND-RELATED ASSEMBLAGES IN PASSAMAQUODDY BAY. MA thesis, Department of Anthropology, McMaster University.

Bishop, J.C. 1983b. THE PHIL'S BEACH SITE. Nexus: The Canadian Student Journal of Anthropology 3(1&2):15-59.

Bishop, J.C. in press. THE PARTRIDGE ISLAND SITE: EARLY AND MIDDLE WOODLAND-RELATED ASSEMBLAGES IN PASSAMAQUODDY BAY. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology.

Bishop, J.C., and D.W. Black. 1988. THE LANDS EDGE ALSO: CULTURE HISTORY AND SEASONALITY AT THE PARTRIDGE ISLAND SHELL MIDDEN SITE. Canadian Journal of Archaeology 12:17-37.

Black, D.W. 1981. PROPOSAL FOR RESEARCH INTO THE CULTURAL ECOLOGY OF BgDr48, A SHELL MIDDEN IN NEW BRUNSWICK. Ms. on file, Archaeological Services of New Brunswick, Department of Tourism, Recreation and Heritage.

****

Black, D.W. 1983a. WHAT IMAGES RETURN: A STUDY OF THE STRATIGRAPHY AND SEASONALITY OF A SMALL SHELL MIDDEN IN THE WEST ISLES OF NEW BRUNSWICK. MA thesis, Department of Anthropology, McMaster University.

Black, D.W. 1984a. AN ARCHAEOLOGICAL SURVEY OF THE SHORES OF THE GRAND MANAN ARCHIPELAGO. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #5.

Black, D.W. 1984b. BgDr38: TEST EXCAVATIONS AT A MULTI-COMPONENT PREHISTORIC/HISTORIC SITE ON DEER ISLAND. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #7.

Black, D.W. 1984c. LIVING IN BLISS: AN INTRODUCTION TO THE PREHISTORIC ARCHAEOLOGY OF THE BLISS ISLANDS GROUP, QUODDY REGION, NEW BRUNSWICK. Presented at the 17th annual meeting of the Canadian Archaeological Association, Victoria, British Columbia.

Black, D.W. 1984d. WERE ALL SHELL MIDDENS CREATED EQUAL? OR ARE SOME SHELL MIDDENS MORE EQUAL THAN OTHERS? Seminar presented to the Department of Anthropology, McMaster University.

Black, D.W. 1985a. LIVING IN BLISS: AN INTRODUCTION TO THE ARCHAEOLOGY OF THE BLISS ISLANDS GROUP, CHARLOTTE COUNTY, NEW BRUNSWICK. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #8.

Black, D.W. 1985b. RAISE HIGH THE TROPHIC LEVEL, HOMINIDS: A QUANTITATIVE APPROACH TO HUNTER-GATHERER PRODUCTION AND SPECIALIZATION IN CONTRASTING ECOLOGICAL REGIMES. Ms. on file, Archaeological Services of New Brunswick, Department of Tourism, Recreation and Heritage.

Black, D.W. 1987. AN OVERVIEW OF THE BLISS ISLANDS ARCHAEOLOGY PROJECT. Maine Archaeological Society Newsletter 1(2):5-9.

Black, D.W. (ed.) 1988a. BLISS REVISITED: PRELIMINARY ACCOUNTS OF THE BLISS ISLANDS ARCHAEOLOGY PROJECT, PHASE II. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #24.

Black, D.W. 1988b. INTENSIVE SHELLFISHING IN THE QUODDY REGION: A PRELIMINARY ANALYSIS OF THE WEIR SITE. In D.W. Black (ed.), BLISS REVISITED: PRELIMINARY ACCOUNTS OF THE BLISS ISLANDS ARCHAEOLOGY PROJECT, PHASE II. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #24.

Black, D.W. 1988c. THE LEDGE SITE: ARCHAEOLOGY WITHOUT ARTIFACTS. In D.W. Black (ed.), BLISS REVISITED: PRELIMINARY ACCOUNTS OF THE BLISS ISLANDS ARCHAEOLOGY PROJECT, PHASE II. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #24.

Black, D.W. 1988d. THE LIGHTHOUSE COVE SITE. In D.W. Black (ed.), BLISS REVISITED: PRELIMINARY ACCOUNTS OF THE BLISS ISLANDS ARCHAEOLOGY PROJECT, PHASE II. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #24.

Black, D.W. 1988e. THE PINTLOWES COVE SITE. In D.W. Black (ed.), BLISS REVISITED: PRELIMINARY ACCOUNTS OF THE BLISS ISLANDS ARCHAEOLOGY PROJECT, PHASE II. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #24.

Black, D.W. 1988f. BLISS REVISITED: CHRONOLOGY, SITE TYPOLOGY AND PREHISTORIC SETTLEMENT ON THE BLISS ISLANDS. Paper presented at the 55th annual meeting of the Eastern States Archaeological Federation, Toronto, Ontario.

Black, D.W. in press a. WHAT IMAGES RETURN: A STUDY OF THE STRATIGRAPHY AND SEASONALITY OF A SHELL MIDDEN IN THE INSULAR QUODDY REGION OF NEW BRUNSWICK. New Brunswick Archaeology, Series 1.

Black, D.W. in press b. STRATIGRAPHIC INTEGRITY IN NORTHEASTERN SHELL MIDDENS: AN EXAMPLE FROM THE INSULAR QUODDY REGION. In M. Deal (ed.), ARCHAEOLOGY IN THE MARITIMES: PAST AND PRESENT RESEARCH. Fredericton: Council of Maritime Premiers.

Black, D. W., K. Gruspier and D.A. Johnston. 1988. THE CAMP SITE: STRUCTURAL AND SUBSISTENCE ANALYSES OF AN INSULAR QUODDY REGION SHELL MIDDEN. Paper presented at the 21st annual meeting of the Canadian Archaeological Association, Whistler, British Columbia.

Black, D.W., and H.L. Hale. 1986. A RETROSPECTIVE ACCOUNT OF SOME ABORIGINAL SHELL MIDDENS IN THE QUODDY REGION, NEW BRUNSWICK. Presented at the 19th annual meeting of the Canadian Archaeological Association, Toronto, Canada.

Black, D.W., and D.A. Johnston. 1986. AN ANALYSIS OF COLUMN SAMPLES FROM THE GOOSEBERRY POINT SITE, QUODDY REGION, NEW BRUNSWICK. Ms. on file, Archaeological Services of New Brunswick, Department of Tourism, Recreation and Heritage.

****

LIVING CLOSE TO THE LEDGE

Black, D.W., and C.J. Turnbull. 1986. RECENT ARCHAEOLOGICAL RESEARCH IN THE INSULAR QUODDY REGION, NEW BRUNSWICK, CANADA. Current Anthropology 27(4):400-402.

Black, D.W. and R.H. Whitehead. 1988. PREHISTORIC SHELLFISH PRESERVATION AND STORAGE ON THE NORTHEAST COAST. North American Archaeologist 9(1):17-30.

Bock, P.K. 1978. MICMAC. In B.G. Trigger (ed.), HANDBOOK OF NORTH AMERICAN INDIANS, vol. 15--NORTHEAST. Washington: Smithsonian Institution.

Bonnichsen, R., and D. Sanger. 1977. INTEGRATING FAUNAL ANALYSIS. Canadian Journal of Archaeology 1:109-133.

Bourque, B.J. 1971. THE PREHISTORY OF THE CENTRAL MAINE COAST. PhD dissertation, Department of Anthropology, Harvard University.

Bourque, B.J. 1973. ABORIGINAL SETTLEMENT AND SUBSISTENCE ON THE MAINE COAST. Man In The Northeast 6:3-20.

Bourque, B.J., K. Morris and A.E. Spiess. 1978. DETERMINING THE SEASON OF DEATH OF MAMMAL TEETH FROM ARCHAEOLOGICAL SITES: A NEW SECTIONING TECHNIQUE. Science 199:530-531.

Bousfield, E.L., and M.L.H. Thomas. 1975. POSTGLACIAL CHANGES IN DISTRIBUTION OF LITTORAL MARINE INVERTEBRATES IN THE CANADIAN ATLANTIC REGION. Proceedings of the Nova Scotia Institute of Science 27(3):47-60.

Brennan, L.A. 1977. THE MIDDEN IS THE MESSAGE. Archaeology of Eastern North America 5:122-138.

Brinkhurst, R.O., L.E. Linkletter, E.I. Lord, S.A. Connors, and M.J. Dadswell. 1975. A PRELIMINARY GUIDE TO THE LITTORAL AND SUBLITTORAL INVERTEBRATES OF PASSAMAQUODDY BAY. St. Andrews, N.B.: Huntsman Marine Laboratory.

Burleigh, R. 1974. RADIOCARBON DATING: SOME PRACTICAL CONSIDERATIONS FOR THE ARCHAEOLOGIST. Journal of Archaeological Science 10:361-367.

Butzer, K. 1982. ARCHAEOLOGY AS HUMAN ECOLOGY: METHOD AND THEORY FOR A CONTEXTUAL APPROACH. New York: Cambridge University Press.

Cahen, D., and J. Moeyersons. 1977. SUBSUSRFACE MOVEMENTS OF STONE ARTIFACTS AND THEIR IMPLICATIONS FOR THE PREHISTORY OF CENTRAL AFRICA. Nature 266:812-815.

Carlson, C. 1986. MARITIME CATCHMENT AREAS: AN ANALYSIS OF PREHISTORIC FISHING STRATEGIES IN THE BOOTHBAY REGION OF MAINE. MSc thesis, Quaternary Studies, University of Maine at Orono.

Carlson, C. 1988. AN EVALUATION OF FISH GROWTH ANNULI FOR THE DETERMINATION OF SEASONALITY IN ARCHAEOLOGICAL SITES. In R.E. Webb (ed.), RECENT DEVELOPMENTS IN ENVIRONMENTAL ANALYSIS IN OLD AND NEW WORLD ARCHAEOLOGY. British Archaeological Reports, International Series 416.

Casteel, R.W. 1977. CHARACTERIZATION OF FAUNAL ASSEMBLAGES AND THE MINIMUM NUMBER OF INDIVIDUALS DETERMINED FROM PAIRED ELEMENTS: CONTINUING PROBLEMS IN ARCHAEOLOGY. Journal of Archaeological Science 4:125-134.

Casteel, R.W. 1978. FAUNAL ASSEMBLAGES AND THE 'WEIGEMETHODE' OR WEIGHT METHOD. Journal of Field Archaeology 5:71-77.

Chisholm, B.S., D.E. Nelson and H.P. Schwarcz. 1982. STABLE CARBON ISOTOPES AS A MEASURE OF MARINE VS. TERRESTRIAL PROTEIN IN ANCIENT DIETS. Science 216:1131-1132.

Christenson, A.L. 1980. CHANGE IN THE HUMAN NICHE IN RESPONSE TO POPULATION GROWTH. In T.K. Earle and A.L. Christenson (eds.), MODELLING CHANGE IN PREHISTORIC SUBSISTENCE ECONOMIES. New York: Academic Press.

Christianson D.J. 1979. THE USE OF SUBSISTENCE STRATEGY DESCRIPTIONS IN DETERMINING WABANAKI RESIDENCE LOCATION. The Journal of Anthropology at McMaster 5(1):81-124.

Christie, D.S. 1983. BIRDS. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Claassen, C.P. 1982. SHELLFISHING PATTERNS: ANALYTICAL STUDY OF PREHISTORIC SHELL FROM NORTH CAROLINA COASTAL MIDDENS. PhD dissertation, Department of Anthropology, Harvard University.

Claassen, C.P. 1986. SHELLFISHING SEASONS IN THE PREHISTORIC SOUTHEASTERN UNITED STATES. American Antiquity 51(1):21-37.

Clarke, A.H. 1971. LITTORINA LITTOREA: NATIVE OR INTRODUCED? The Biologist 53(3):160-163.

****

Connolly, J. 1977. ARCHAEOLOGY IN NOVA SCOTIA AND NEW BRUNSWICK BETWEEN 1863 AND 1914 AND ITS RELATIONSHIP TO THE DEVELOPMENT OF NORTH AMERICAN ARCHAEOLOGY. Man in the Northeast 13:3-35.

Cox, S.L. 1987. ARCHAEOLOGICAL DATA RECOVERY AT SITE 61.20, JONESPORT, MAINE. Maine Archaeological Society Bulletin 27(2):16-35.

Crotts, A. 1984. PATTERN AND VARIATION ON LITHIC RESOURCE EXPLOITATION IN PASSAMAQUODDY BAY, CHARLOTTE COUNTY, NEW BRUNSWICK. MSc. thesis, Quaternary Studies, University of Maine at Orono.

Crowe, S. 1986. PREHISTORIC CERAMICS FROM A SHELL MIDDEN ON THE BLISS ISLANDS. Paper prepared for Anthropology 461.0, St. Mary's University, Halifax, Nova Scotia.

Cumming, L.M. 1967. GEOLOGY OF THE PASSAMAQUODDY BAY REGION, CHARLOTTE COUNTY, NEW BRUNSWICK. Geological Survey of Canada, Paper #65-69.

Custer, J.F. 1988. COASTAL ADAPTATIONS IN THE MIDDLE ATLANTIC REGION. Archaeology of Eastern North America 16:121-136.

Davis, D.D. 1988. COASTAL BIOGEOGRAPHY AND HUMAN SUBSISTENCE: EXAMPLES FROM THE WEST INDIES. Archaeology of Eastern North America 16:177-185.

Davis, S.A. 1978. TEACHER'S COVE: A PREHISTORIC SITE ON PASSAMAQUODDY BAY. New Brunswick Historical Resources Administration, New Brunswick Archaeology 1.

Davis, S.A. 1982a. A LATE ARCHAIC CACHE/BURIAL FROM NEW BRUNSWICK. Man in the Northeast 24:135-146.

Davis, S.A. 1982b. COASTAL EROSION AND ARCHAEOLOGICAL SITES IN CHARLOTTE CO., NEW BRUNSWICK--1980 SURVEY. In C.J. Turnbull (ed.), ARCHAEOLOGICAL RESOURCES IN THE MARITIMES--1980. Council of Maritime Premiers, Reports in Archaeology #5.

Davis, S.A. 1983. RISING SEA LEVELS THREATEN ARCHAEOLOGICAL SITES. Canadian Geographical Journal 103(2):40-46.

Davis, S.A. 1988. THE CERAMIC PERIOD IN NOVA SCOTIA. Paper presented at the 21st annual meeting of the Canadian Archaeological Association, Whistler, B.C.

Davis, S.A., and D.J. Christianson. 1981. ARCHAEOLOGICAL RESOURCES IN THE MARITIMES--A COASTAL SURVEY--1979. Council of Maritime Premiers, Reports in Archaeology 4.

Davis, S.A. and D.J. Christianson. 1988. THREE PALEO-INDIAN SPECIMENS FROM NOVA SCOTIA. Canadian Journal of Archaeology 12:190-196.

Davis, S.A., and A.M. Ferguson. 1980. WEST ISLES ARCHAEOLOGICAL SURVEY. Ms. on file, Archaeological Services, New Brunswick Department of Tourism, Recreation and Heritage.

Davis, S.A., and A.M. Ferguson. 1981. BACK BAY/LETANG HARBOUR ARCHAEOLOGICAL SURVEY. Ms. on file, Archaeology Branch, New Brunswick Department of Tourism, Recreation and Heritage.

Davis, S.A., and S. Powell. 1983. POINT LEPREAU/BEAVER HARBOUR ARCHAEOLOGICAL SURVEY. Ms. on file, Archaeological Services of New Brunswick, Department of Tourism, Recreation and Heritage.

Deal, M. 1984. DIGGITY (BjDu17): A CERAMIC PERIOD SITE ON SPEDNICK LAKE. Ms. on file, Archaeological Services of New Brunswick, Department of Tourism, Recreation and Heritage.

Deal, M. 1985. FINAL REPORT ON THE 1983/1984 EXCAVATIONS AT THE MUD LAKE STREAM SITE (BkDw5), SOUTHWESTERN NEW BRUNSWICK. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #15.

Deal, M. 1986. LATE ARCHAIC AND CERAMIC PERIOD UTILIZATION OF THE MUD LAKE STREAM SITE, SOUTHWESTERN NEW BRUNSWICK. Archaeology of Eastern North America 32:67-94.

Deal, M. 1988. SPEDNIC LAKE CERAMICS: STRUCTURE, DESIGN AND FUNCTION THROUGH TIME. Paper presented at the 21st annual meeting of the Canadian Archaeological Association, Whistler, British Columbia.

Deal, M. (ed.). in prep. ARCHAEOLOGY IN THE MARITIMES: PAST AND PRESENT RESEARCH. Fredericton: Council of Maritime Premiers.

DeNiro, M.J. 1985. POSTMORTEM PRESERVATION AND ALTERATION OF IN VIVO BONE COLLAGEN ISOTOPE RATIOS IN RELATION TO PALEODIETARY RECONSTRUCTION. Nature 317:806-809.

Dilworth, T. 1984. LAND MAMMALS OF NEW BRUNSWICK. Fredericton: Unipress.

****

Earle, T.K. 1980. A MODEL OF SUBSISTENCE CHANGE. In T.K. Earle and A.L. Christenson (eds.), MODELLING CHANGE IN PREHISTORIC SUBSISTENCE ECONOMIES. New York: Academic Press.

Earle, T.K., and A.L. Christenson (eds.). 1980. MODELLING CHANGE IN PREHISTORIC SUBSISTENCE ECONOMIES. New York: Academic Press.

Erickson, V.O. 1978. MALISEET-PASSAMAQUODDY. In B.G. Trigger (ed.), HANDBOOK OF NORTH AMERICAN INDIANS, vol. 15--NORTHEAST. Washington: Smithsonian Institution.

Ericson, P.G.P. 1987. INTERPRETATIONS OF ARCHAEOLOGICAL BIRD REMAINS: A TAPHONOMIC APPROACH. Journal of Archaeological Science 14:65-75.

Fitzhugh, W.W. (ed.). 1975. PREHISTORIC MARITIME ADAPTATIONS IN THE CIRCUMPOLAR ZONE. The Hague: Mouton.

Fladmark, K.R. 1975. A PALEOECOLOGICAL MODEL FOR NORTHWEST COAST PREHISTORY. National Museum of Canada, Mercury Series, Archaeological Survey of Canada, Paper #43.

Fladmark, K.R. 1983. A COMPARISON OF SEA-LEVELS AND PREHISTORIC CULTURAL DEVELOPMENTS ON THE EAST AND WEST COASTS OF CANADA. In R.J. Nash (ed.), THE EVOLUTION OF MARITIME CULTURES ON THE NORTHEAST AND THE NORTHWEST COASTS OF AMERICA. Simon Fraser University, Department of Archaeology, Publication #11.

Ford, R.I. 1974. NORTHEASTERN ARCHAEOLOGY: PAST AND FUTURE DIRECTIONS. Annual Review of Anthropology 3:385-413.

Foulkes, E. 1981. FULTON ISLAND: A STRATIFIED SITE IN THE SAINT JOHN RIVER VALLEY OF NEW BRUNSWICK. MA thesis, Department of Anthropology, Trent University.

Ganong, W.F. 1899. A MONOGRAPH OF HISTORICAL SITES IN THE PROVINCE OF NEW BRUNSWICK. Royal Society of Canada, Transactions 2(5):213-357.

Ganong, W.F. (ed.). 1930. HISTORICAL-GEOGRAPHIC DOCUMENTS RELATING TO NEW BRUNSWICK. MR. OSCAR HANSON'S MEMORANDA ON THE SETTLEMENT OF THE COAST FROM MUSQUASH TO BEAVER HARBOUR. Collections of the New Brunswick Historical Society 5(13):114-131.

Ganong, W.F. 1983. HISTORIC SITES IN THE PROVINCE OF NEW BRUNSWICK. St. Stephen, N.B.: Print'n'Press, Ltd.

Gaskin, D.E. 1983. THE MARINE MAMMAL COMMUNITY. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Goddard, I. 1978. EASTERN ALGONKIAN LANGUAGES. In B.G. Trigger (ed.), HANDBOOK OF NORTH AMERICAN INDIANS, vol. 15--NORTHEAST. Washington: Smithsonian Institution.

Goggin, J.M. 1949. CULTURE TRADITIONS IN FLORIDA. In J.W. Griffin (ed.), THE FLORIDA INDIAN AND HIS NEIGHBOURS. Winter Park.

Grant, D.R. 1970. RECENT COASTAL SUBMERGENCE OF THE MARITIMES PROVINCES, CANADA. Canadian Journal of Earth Sciences 7:676-689.

Grayson, D.K. 1973. ON THE METHODOLOGY OF FAUNAL ANALYSIS. American Antiquity 38:432-439.

Grayson, D.K. 1978. MINIMUM NUMBERS AND SAMPLE SIZES IN VERTEBRATE FAUNAL ANALYSIS. American Antiquity 43:53-65.

Grayson, D.K. 1979. ON THE QUANTIFICATION OF VERTEBRATE ARCHAEOFAUNAS. In M.B. Schiffer (ed.), ADVANCES IN ARCHAEOLOGICAL METHOD AND THEORY, vol. 2. New York: Academic Press.

Gruspier, K. 1987. THE FAUNAL REMAINS FROM THE CAMP SITE (BgDq4), BLISS ISLANDS, QUODDY REGION, NEW BRUNSWICK. Ms. on file, Faunal Osteo-archaeology Lab, University of Toronto.

Hale, H.L. 1985. ARCHAEOLOGICAL SURVEY AND TESTING OF THE ST. CROIX RIVER AND SPEDNIC AND PALFREY LAKES, NEW BRUNSWICK--1984. New Brunswick Department of Historical and Cultural Resources, Manuscripts in Archaeology #14.

Hale, H.L., R.S. Finley, and D.W. Black. 1988. BLISS ISLANDS ARCHAEOLOGICAL PROJECT, PHASE II, SUMMARY. In D.W. Black (ed.), BLISS REVISITED: PRELIMINARY ACCOUNTS OF THE BLISS ISLANDS ARCHAEOLOGY PROJECT, PHASE II. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #24.

Ham, L.C. 1983. SEASONALITY OF SHELL MIDDEN LAYERS AND SUBSISTENCE ACTIVITIES AT THE CRESCENT BEACH SITE (DgRr1). PhD dissertation, Department of Sociology and Anthropology, University of British Columbia.

****

LIVING CLOSE TO THE LEDGE

Hammon-Demma, D. 1984. A CERAMIC PERIOD COASTAL ADAPTATION IN HOLT'S POINT, NEW BRUNSWICK. MA thesis, Department of Anthropology, University of New Brunswick.

Hancock, M.E. 1982. THE DETERMINATION OF ARCHAEOLOGICAL SITE SEASONALITY USING THE REMAINS OF MYA ARENARIA LINN.: EXAMPLES FROM THE CENTRAL MAINE COAST. MSc thesis, Quaternary Studies, University of Maine at Orono.

Hardesty, D.L. 1975. THE NICHE CONCEPT: SOME SUGGESTIONS FOR ITS USE IN HUMAN ECOLOGY. Human Ecology 3:71-85.

Hardesty, D.L. 1980. THE USE OF GENERAL ECOLOGICAL PRINCIPLES IN ARCHAEOLOGY. In M.B. Schiffer (ed.), ADVANCES IN ARCHAEOLOGICAL METHOD AND THEORY, vol. 3. New York: Academic Press.

Harris, E.C. 1975. THE STRATIGRAPHIC SEQUENCE: A QUESTION OF TIME. World Archaeology 7(1):109-121.

Harris, E.C. 1977. UNITS OF ARCHAEOLOGICAL STRATIFICATION. Norwegian Archaeological Review 10(1-2):84-94.

Harris, E.C. 1979a. THE LAWS OF ARCHAEOLOGICAL STRATIGRAPHY. World Archaeology 11(1):111-117.

Harris, E.C. 1979b. PRINCIPLES OF ARCHAEOLOGICAL STRATIGRAPHY. New York: Academic Press.

Harris, E.C. 1984. THE ANALYSIS OF MULTILINEAR STRATIGRAPHIC SEQUENCES. Scottish Archaeological Review 3:127-133.

Hastorf, C.A., and M.J. DeNiro. 1985. RECONSTRUCTION OF PREHISTORIC PLANT PRODUCTION AND COOKING PRACTICES BY A NEW ISOTOPIC METHOD. Nature 315:489-491.

Hayden, B. 1980. SUBSISTENCE AND ECOLOGICAL ADAPTATIONS OF MODERN HUNTER/GATHERERS. In R.S.O. Harding and G. Teleki (eds.), OMNIVOROUS PRIMATES. New York: Columbia University Press.

Herisson, M.R.P. 1974. AN EVALUATIVE ETHNO-HISTORICAL BIBLIOGRAPHY OF THE MALICITE INDIANS. National Museum of Man, Mercury Series, Canadian Ethnological Service, Paper #16.

Hester, J.J., and J. Grady. 1982. INTRODUCTION TO ARCHAEOLOGY (2nd edition). New York: Holt, Rinehart and Winston.

Hinds, H.R. 1983. THE COASTAL FOREST OF THE PASSAMAQUODDY BAY AREA. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Hoffman, B.G. 1955. SOURIQUIOS, ETECHEMIN, AND KWEDECH... A LOST CHAPTER IN AMERICAN ETHNOLOGY. Ethnohistory 2:65-93.

Hoyt, E. 1984. THE WHALES OF CANADA. Camden East, Ont.: Camden House.

Hughes, P.J., and R.J. Lampert. 1977. OCCUPATIONAL DISTURBANCE AND TYPES OF ARCHAEOLOGICAL DEPOSIT. Journal of Archaeological Science 4:135-140.

Hutchinson, G.E. 1978. AN INTRODUCTION TO POPULATION ECOLOGY. New Haven: Yale University Press.

Jochim, M.A. 1976. HUNTER-GATHERER SUBSISTENCE AND SETTLEMENT: A PREDICTIVE MODEL. New York: Academic Press.

Jochim, M.A. 1981. STRATEGIES FOR SURVIVAL: CULTURAL BEHAVIOUR IN AN ECOLOGICAL CONTEXT. New York: Academic Press.

Joudry, G.N. 1955. THE ARCHAEOLOGY OF NEW BRUNSWICK. BA honors thesis, Department of History, Mount Alison University.

Katzenberg, M.A. 1987. 13C IN HUMAN COLLAGEN: CONTRIBUTIONS FROM PLANTS AND ANIMALS. Paper presented at the 15th annual meeting of the Canadian Association for Physical Anthropology, Toronto, Ontario.

Keene, A.S. 1981. FORAGING IN A NONMARGINAL ENVIRONMENT: A MODEL OF PREHISTORIC SUBSISTENCE STRATEGIES IN MICHIGAN. In B. Winterhalder and E.A. Smith (eds.), HUNTER-GATHERER FORAGING STRATEGIES. ETHNOLOGICAL AND ARCHAEOLOGICAL ANALYSES. Chicago: University of Chicago Press.

Keenlyside, D.L. 1980. PREHISTORY OF THE GULF OF ST. LAWRENCE 'SOUTHERN BASIN'. In D.M. Shimabuku (ed.), PROCEEDINGS OF THE 1980 CONFERENCE ON THE FUTURE OF ARCHAEOLOGY IN THE MARITIME PROVINCES. St. Mary's University, Department of Anthropology, Occasional Papers #8.

****

LIVING CLOSE TO THE LEDGE

Keenlyside, D.L. 1983. LATE PREHISTORIC POPULATIONS OF NORTHEASTERN PRINCE EDWARD ISLAND. Paper presented at the 16th annual meeting of the Canadian Archaeological Association, Halifax, Nova Scotia.

Keenlyside, D. 1984. ULUS AND SPEARPOINTS: TWO NEW ARCHAEOLOGICAL FINDS FROM PRINCE EDWARD ISLAND. The Island Magazine 16:25-28.

Keith, M.L., G.M. Anderson and R. Eichler. 1964. CARBON AND OXYGEN ISOTOPIC COMPOSITION OF MOLLUSK SHELLS FROM MARINE AND FRESHWATER ENVIRONMENTS. Geochimica et Cosmochimica Acta 28:1757-1786.

Kellogg, D.C. 1982. ENVIRONMENTAL FACTORS IN ARCHAEOLOGICAL SITE LOCATION FOR THE BOOTHBAY, MAINE REGION. M.S. thesis, Quaternary Studies, University of Maine at Orono.

Kellogg, D.C. 1987. STATISTICAL RELEVANCE AND SITE LOCATIONAL DATA. American Antiquity 52(1):143-150.

Kellogg, D.C., and D. Sanger. 1984. IS WHAT YOU HAVE WHAT YOU HAD? SITE SURVEY AND SETTLEMENT PATTERN ANALYSIS IN COASTAL ENVIRONMENTS. Paper presented at the 17th annual meeting of the Canadian Archaeological Association, Victoria, B.C.

Kirch, P.V. 1980. THE ARCHAEOLOGICAL STUDY OF ADAPTATION. In M.B. Schiffer (ed.), ADVANCES IN ARCHAEOLOGICAL METHOD AND THEORY, vol. 3. New York: Academic Press.

Kopec, D. 1985. THE EDDIE BROWN COLLECTION. Maine Archaeological Society Bulletin 25:3-37.

Lavin, L. 1988. COASTAL ADAPTATIONS IN SOUTHERN NEW ENGLAND AND SOUTHERN NEW YORK. Archaeology of Eastern North America 16:101-120.

Lavoie, J. 1971. LE SITE SANDY POINT (BgDs6) ET L'ORIGINE DE LA TRADITION SYLVICOLE DANS LA REGION DE LA BAIE DE PASSAMAQUODDY, NOVEAU-BRUNSWICK. MA thesis, Department of Anthropology, University of Montreal.

Lescarbot, M. 1928. NOVA FRANCIA, A DESCRIPTION OF ACADIA, 1606. New York: Harper and Brothers.

Levins, R. 1968. EVOLUTION IN CHANGING ENVIRONMENTS. Princeton: Princeton University Press.

Liem, A.H., and W.B. Scott. 1966. FISHES OF THE ATLANTIC COAST OF CANADA. Fisheries Research Board of Canada, Bulletin #155.

Logan, A., A.W. MacKay, and J.P.A. Noble. 1983. SUBLITTORAL HARD SUBSTRATES. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Loring, S. 1988. REVIEW OF 'THE CARSON SITE'. Maine Archaeological Society Bulletin 28(1):48-54.

Loring, S. in press. KEEPING THINGS WHOLE: NEARLY TWO THOUSAND YEARS OF INDIAN (INNU) OCCUPATION IN NORTHERN LABRADOR. In BOREAL FOREST AND SUBARCTIC ARCHAEOLOGY. Occasional Publications of the London Chapter of the Ontario Archaeological Society, #6.

Lyman, R.L. 1979. AVAILABLE MEAT FROM FAUNAL REMAINS: A CONSIDERATION OF TECHNIQUES. American Antiquity 44:536-546.

Lyman, R.L. 1982. ARCHAEOFAUNAS AND SUBSISTENCE STUDIES. In M.B. Schiffer (ed.), ADVANCES IN ARCHAEOLOGICAL METHOD AND THEORY, vol. 5. New York: Academic Press.

MacDonald, G.F. 1969. DEBERT: A PALEOINDIAN SITE IN CENTRAL NOVA SCOTIA. National Museum of Canada, Anthropology Paper # 16.

MacDonald, J.S., M.J. Dadswell, R.G. Appy, G.D. Melvin and D.A. Methven. 1984. FISHES, FISH ASSEMBLAGES AND THEIR SEASONAL MOVEMENTS IN THE LOWER BAY OF FUNDY AND PASSAMAQUODDY BAY, CANADA. Fisheries Bulletin 82(1):121-139.

MacKay, A.A. 1976. THE SEA URCHIN ROE INDUSTRY ON NEW BRUNSWICK'S BAY OF FUNDY COAST. Fredericton: New Brunswick Department of Fisheries.

MacKay, A.A., R. Bosien and B. Wells. 1978. THE BAY OF FUNDY RESOURCE INVENTORY, VOLUME 3: DEER ISLAND AND CAMPOBELLO ISLAND. Fredericton: New Brunswick Department of Fisheries.

Mangerud, J. 1972. RADIOCARBON DATING OF MARINE SHELLS, INCLUDING A DISCUSSION OF APPARENT AGES OF RECENT SHELLS FROM NORWAY. Boreas 1:143-172.

Mason, R.J. 1981. GREAT LAKES ARCHAEOLOGY. New York: Academic Press.

Matthew, G.F. 1884. DISCOVERIES AT A VILLAGE OF THE STONE AGE AT BOCABEC, N.B. Bulletin of the Natural History Society of New Brunswick 3(2):6-27.

May, J.A. 1982. MIDDEN FORMATION MODELLING USING ETHNOGRAPHIC AND ARCHAEOLOGICAL DATA: A TREND SURFACE ANALYSIS OF MIDDEN DEPOSITS AT THE CARLSTON ANNIS SITE, KENTUCKY. PhD dissertation, Department of Anthropology, University of Missouri at Columbia.

McCormick, J.S. 1980. CRITERIA IN ARCHAEOLOGICAL FAUNAL ANALYSIS: FOUR PASSAMAQUODDY BAY CASES. MSc. thesis, Quaternary Studies, University of Maine at Orono.

McManamon, F.P. 1982. PREHISTORIC LAND USE ON OUTER CAPE COD. Journal of Field Archaeology 9(1):1-20.

McManamon, F.P. 1984. PREHISTORIC CULTURAL ADAPTATIONS ON CAPE COD. PhD dissertation, Department of Anthropology, State University of New York at Binghampton.

Meehan, B. 1977. HUNTERS BY THE SEASHORE. Journal of Human Evolution 6:363-370.

Meehan, B. 1982. SHELL BED TO SHELL MIDDEN. Canberra: Australian Institute of Aboriginal Studies.

Miksicek, C.H. 1987. FORMATION PROCESSES OF THE ARCHAEOBOTANICAL RECORD. In M.B. Schiffer (ed.), ADVANCES IN ARCHAEOLOGICAL METHOD AND THEORY, vol. 10. New York: Academic Press.

Monks, G.G. 1981. SEASONALITY STUDIES. In M.B. Schiffer (ed.), ADVANCES IN ARCHAEOLOGICAL METHOD AND THEORY, vol. 4. New York: Academic Press.

Morton, J.D. 1988. STABLE ISOTOPE ANALYSIS OF FOOD RESIDUES FROM ONTARIO CERAMICS. Paper presented at the 14th McMaster Anthropology Society Symposium.

Morton, J.D., and H.P. Schwarcz. 1988. STABLE ISOTOPE ANALYSIS OF FOOD RESIDUES FROM ONTARIO CERAMICS. In R.M. Farqhuar et al. (eds.), PROCEEDINGS OF THE 26TH INTERNATIONAL ARCHAEOMETRY SYMPOSIUM. Toronto: University of Toronto Press.

Mott, R.J. 1974. PALYNOLOGICAL STUDIES OF LAKE SEDIMENT PROFILES FROM SOUTHWESTERN NEW BRUNSWICK. Canadian Journal of Earth Sciences 12:273-288.

Muckle, R. 1982. THE INTERPRETATION OF SHELL MIDDEN STRUCTURE: AN EXPERIMENTAL APPROACH. Paper presented at the 15th annual meeting of the Canadian Archaeological Association, Hamilton, Ontario.

Muckle, R.J. 1985. ARCHAEOLOGICAL CONSIDERATIONS OF BIVALVE SHELL TAPHONOMY. MA thesis, Department of Archaeology, Simon Fraser University.

Nash, R.J. 1980. RESEARCH STRATEGIES, ECONOMIC PATTERNS, AND EASTERN NOVA SCOTIA PREHISTORY. In D.M. Shimabuku (ed.), PROCEEDINGS OF THE 1980 CONFERENCE ON THE FUTURE OF ARCHAEOLOGY IN THE MARITIME PROVINCES. St. Mary's University, Department of Anthropology, Occasional Papers #8.

Nash, R.J. (ed.). 1983. THE EVOLUTION OF MARITIME CULTURES ON THE NORTHEAST AND THE NORTHWEST COASTS OF AMERICA. Simon Fraser University, Department of Archaeology, Publication #11.

Nash, R.J. 1986. MI'KMAQ: ECONOMICS AND EVOLUTION. Nova Scotia Museum, Curatorial Report #57.

Odum, E.P. 1971. FUNDAMENTALS OF ECOLOGY (3rd edition). Philadelphia: W.B. Saunders Co.

Osborn, A.J. 1977a. ABORIGINAL EXPLOITATION OF MARINE FOOD RESOURCES. PhD dissertation, Department of Anthropology, University of New Mexico.

Osborn, A.J. 1977b. STRANDLOOPERS, MERMAIDS, AND OTHER FAIRY TALES: ECOLOGICAL DETERMINANTS OF MARINE RESOURCE UTILIZATION--THE PERUVIAN CASE. In L.R. Binford (ed.), FOR THEORY BUILDING IN ARCHAEOLOGY. New York: Academic Press.

Pearson, R.J. 1970. ARCHAEOLOGICAL INVESTIGATIONS IN THE ST. ANDREWS AREA, NEW BRUNSWICK. Anthropologica 12:181-190.

Perlman, S.M. 1977. OPTIMUM DIET MODELS AND PREHISTORIC HUNTER/GATHERERS: A TEST ON MARTHA'S VINEYARD. PhD dissertation, Department of Anthropology, University of Massachusetts.

Perlman, S.M. 1980. AN OPTIMUM DIET MODEL, COASTAL VARIABILITY, AND HUNTER-GATHERER BEHAVIOUR. In M.B. Schiffer (ed.), ADVANCES IN ARCHAEOLOGICAL METHOD AND THEORY, vol. 3. New York: Academic Press.

****

LIVING CLOSE TO THE LEDGE

Petersen, J.B. 1988. THE PSEUDO SCALLOP SHELL CERAMIC HORIZON STYLE IN NORTH AMERICAN PREHISTORY. Paper presented at the 21st annual meeting of the Canadian Archaeological Association, Whistler, British Columbia.

Pianka, E.R. 1978. EVOLUTIONARY ECOLOGY. New York: Harper.

Quinn, D.B. 1981. SOURCES FOR THE ETHNOGRAPHY OF NORTHEASTERN NORTH AMERICA TO 1611. National Museum of Man, Mercury Series, Canadian Ethnological Service, Paper #76.

Rampton, V.N., R.C. Gauthier, J. Thibault and A.A. Seaman. 1984. QUATERNARY GEOLOGY OF NEW BRUNSWICK. Geological Survey of Canada, Memoir #416.

Reidhead, V.A. 1979. LINEAR PROGRAMMING MODELS IN ARCHAEOLOGY. Annual Review of Anthropology 8:543-78.

Reitz, E.J. 1988. EVIDENCE FOR COASTAL ADAPTATIONS IN GEORGIA AND SOUTH CAROLINA. Archaeology of Eastern North America 16:137-158.

Ritchie, W.A. 1969. THE ARCHAEOLOGY OF NEW YORK STATE. New York: Natural History Press.

Robins, K., and D.W. Black. 1988. ORGANIC ARTIFACTS FROM THE BLISS ISLANDS. In D.W. Black (ed.), BLISS REVISITED: PRELIMINARY ACCOUNTS OF THE BLISS ISLANDS ARCHAEOLOGY PROJECT, PHASE II. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #24.

Rojo, A. 1986. LIVE LENGTH AND WEIGHT OF COD (G. MORHUA) ESTIMATED FROM VARIOUS SKELETAL ELEMENTS. North American Archaeologist 7(4):329-351.

Rojo, A. 1987. EXCAVATED FISH VERTEBRAE AS PREDICTORS IN BIOARCHAEOLOGICAL RESEARCH. North American Archaeologist 8(3):209-225.

Ruitenberg, A.A. 1968. GEOLOGY AND MINERAL DEPOSITS, PASSAMAQUODDY BAY AREA. New Brunswick Department of Natural Resources, Mineral Resources Branch, Report of Investigation 7.

Russo, M. 1988. COASTAL ADAPTATIONS IN EASTERN FLORIDA: MODELS AND METHODS. Archaeology of Eastern North America 16:159-176.

Ryan, B.F., B.L. Joiner, and T.A. Ryan. 1985. MINITAB HANDBOOK (2nd ed.). Boston: Duxbury Press.

Sanger, D. 1971. THE PREHISTORY OF PASSAMAQUODDY BAY, A SUMMARY. Maine Archaeological Society Bulletin 2(2):14-19.

Sanger, D. 1974. RECENT MEETINGS IN MAINE/MARITIMES ARCHAEOLOGY. Man in the Northeast 7:128-129.

Sanger, D. (ed.) 1979a. DISCOVERING MAINE'S ARCHAEOLOGICAL HERITAGE. Augusta, Me: Maine Historic Preservation Commission.

Sanger, D. 1979b. AN INTRODUCTION TO THE PREHISTORY AND PALEO-ENVIRONMENTS OF THE MAINE-MARITIME PROVINCES AREA. In D. Sanger (ed.), DISCOVERING MAINE'S ARCHAEOLOGICAL HERITAGE. Augusta, Me: Maine Historic Preservation Commission.

Sanger, D. 1981. UNSCRAMBLING THE MESSAGES IN THE MIDDEN. Archaeology of Eastern North America 7:37-41.

Sanger, D. 1982. CHANGING VIEWS OF ABORIGINAL SETTLEMENT AND SEASONALITY ON THE GULF OF MAINE. Canadian Journal of Anthropology 2(2):195-203.

Sanger, D. 1983. ARCHAEOZOOLOGY OF THE GULF OF MAINE. In C. Grigson and J. Clutton-Brock (eds.), ANIMALS AND ARCHAEOLOGY, vol. 2: SHELL MIDDENS, FISHES AND BIRDS. British Archaeological Reports, International Series #183.

Sanger, D. 1984. SEA LEVEL RISE IN PASSAMAQUODDY BAY. In E.B. Thompson and J. Kelley (eds.), NEW ENGLAND SEISMOTECTONIC STUDY IN MAINE DURING FISCAL YEAR 1983. Augusta, Me.: Maine Geological Survey Report to the Nuclear Regulatory Commission.

Sanger, D. 1985a. CULTURAL ECOLOGY IN PASSAMAQUODDY BAY. Maine Archaeological Society Bulletin 25(1):10-16.

Sanger, D. 1985b. SEASHORE ARCHAEOLOGY IN NEW ENGLAND. The Quarterly Review of Archaeology 6(2):3-4.

Sanger, D. 1986. AN INTRODUCTION TO THE PREHISTORY OF THE PASSAMAQUODDY BAY REGION. The American Review of Canadian Studies 16(2):139-159.

Sanger, D. 1987. THE CARSON SITE AND THE LATE CERAMIC PERIOD IN PASSAMAQUODDY BAY, NEW BRUNSWICK. National Museum of Canada, Mercury Series, Archaeological Survey of Canada, Paper #135.

Sanger, D. 1988. MARITIME ADAPTATIONS IN THE GULF OF MAINE. Archaeology of Eastern North America 16:81-100.

****
LIVING CLOSE TO THE LEDGE

Sanger, D., and T. Chase. 1983. PRELIMINARY STATEMENT ON THE ARCHAEOLOGY OF THE ROQUE ISLANDS, WASHINGTON COUNTY, MAINE. Paper presented at the 16th annual meeting of the Canadian Archaeological Association, Halifax, Nova Scotia.

Schalk, R. 1977. THE STRUCTURE OF AN ANADROMOUS FISH RESOURCE. In L.R. Binford (ed.), FOR THEORY BUILDING IN ARCHAEOLOGY. New York: Academic Press.

Schiffer, M.B. 1987. FORMATION PROCESSES OF THE ARCHAEOLOGICAL RECORD. Albuquerque: University of New Mexico Press.

Schoeninger, M.J., and M.J. DeNiro. 1984. NITROGEN AND CARBON ISOTOPIC COMPOSITION OF BONE COLLAGEN FROM MARINE AND TERRESTRIAL ANIMALS. Geochimica et Cosmochimica Acta 48:625-639.

Schwarcz, H.P., J. Melbye, M.A. Katzenberg and M. Knyf. 1985. STABLE ISOTOPES IN HUMAN SKELETONS OF SOUTHERN ONTARIO: RECONSTRUCTING PALEODIETS. Journal of Archaeological Science 12:187-206.

Scott, W.B. 1983. FISHES. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Scott, W.B., and M.G. Scott. 1988. ATLANTIC FISHES OF CANADA. Toronto: University of Toronto Press.

Sealy, J.C., N.J. van der Merwe, J.A. Lee Thorp and J.L. Lanham. 1987. NITROGEN ISOTOPIC ECOLOGY IN SOUTH AFRICA: IMPLICATIONS FOR ENVIRONMENTAL AND DIETARY TRACING. Geochimica et Cosmochimica Acta 51:2707-2717.

Shearer, B., and S. Kohl. 1978. 15N ABUNDANCE IN N-FIXING AND NON-N-FIXING PLANTS. In A. Frigerio (ed.), RECENT DEVELOPMENTS IN MASS SPECTROMETRY IN BIOCHEMISTRY AND MEDICINE, vol. 1.

Sheldon, H.L. 1988. THE LATE PREHISTORY OF NOVA SCOTIA. Nova Scotia Museum, Curatorial Report #61.

Shenkel, J.R. 1971. CULTURAL ADAPTATION TO THE MOLLUSK: A METHODOLOGICAL SURVEY OF SHELLMOUND ARCHAEOLOGY AND A CONSIDERATION OF THE SHELLMOUNDS OF THE MARISMAS NACIONALES, WEST MEXICO. PhD dissertation, Department of Anthropology, State University of new York at Buffalo.

Skinas, D.C. 1987. THE TODD SITE: A CASE STUDY OF SHELL MIDDEN FORMATION. MSc thesis, Quaternary Studies, University of Maine at Orono.

Smith, H.I., and W.J. Wintemberg. 1973. SOME SHELL HEAPS IN NOVA SCOTIA. Ottawa: National Museum of Canada.

Snow, D.R. 1976. THE ETHNOHISTORIC BASELINE OF THE EASTERN ABENAKI. Ethnohistory 23:291-306.

Snow, D.R. 1978. EASTERN ABENAKI. In B.G. Trigger (ed.), HANDBOOK OF NORTH AMERICAN INDIANS, vol. 15--NORTHEAST. Washington: Smithsonian Institution.

Snow, D.R. 1980. THE ARCHAEOLOGY OF NEW ENGLAND. New York: Academic Press.

South, G.R. 1981. A GUIDE TO COMMON SEAWEEDS OF ATLANTIC CANADA. St. John's: Breakwater Books.

Speck, F. 1940. PENOBSCOT MAN. Philadelphia: University of Philadelphia Press.

Spiess, A.E. 1976. DETERMINING THE SEASON OF DEATH OF ARCHAEOLOGICAL FAUNA BY ANALYSIS OF TEETH. Arctic 29(1):53-55.

Spiess, A.E. 1988. ON NEW ENGLAND SHELL MIDDENS: RESPONSE TO SANGER'S CAUTIONARY TALE. American Antiquity 53(1):174-177.

Spiess A.E., B.J. Bourque, and S.L. Cox. 1983. CULTURAL COMPLEXITY IN MARITIME CULTURES: EVIDENCE FROM PENOBSCOT BAY, MAINE. In R.J. Nash (ed.), THE EVOLUTION OF MARITIME CULTURES ON THE NORTHEAST AND THE NORTHWEST COASTS OF AMERICA. Simon Fraser University, Department of Archaeology, Publication #11.

Spiess, A.E., and M.H. Hedden. 1983. KIDDER POINT AND SEARS ISLAND IN PREHISTORY. Maine Historic Preservation Commission, Occasional Publications in Maine Archaeology #3.

Squires, W.A. 1952. THE BIRDS OF NEW BRUNSWICK. St. John: New Brunswick Museum.

Squires, W.A. 1968. THE MAMMALS OF NEW BRUNSWICK. St. John: New Brunswick Museum.

Squires, W.A. 1976. THE BIRDS OF NEW BRUNSWICK (2nd edition). St. John: New Brunswick Museum.

****

LIVING CLOSE TO THE LEDGE

Steele, D.H. 1983. COARSE SEDIMENTARY SHORES. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Stein, J.K. 1980. GEOARCHAEOLOGY OF THE GREEN RIVER SHELL MOUND, KENTUCKY. PhD dissertation, Department of Anthropology, University of Minnesota.

Stewart, F. 1974. FAUNAL REMAINS FROM THE CARSON SITE (BgDr5). Archaeological Survey of Canada, Ms. #31012.

Stewart, F.L. 1980. FAUNAL REMAINS FROM FOUR CAPE BRETON ARCHAEOLOGICAL SITES. In D.M. Shimabuku (ed.), PROCEEDINGS OF THE 1980 CONFERENCE ON THE FUTURE OF ARCHAEOLOGY IN THE MARITIME PROVINCES. St. Mary's University, Department of Anthropology, Occasional Papers #8.

Stewart, F.L. 1982. SEASONAL MOVEMENTS OF INDIANS IN ACADIA AS EVIDENCED BY FAUNAL REMAINS AND HISTORICAL DOCUMENTS. Paper presented at the 15th annual meeting of the Canadian Archaeological Association, Hamilton, Ontario.

Stewart, F.L. 1986. FAUNAL REMAINS FROM THE DELOREY ISLAND SITE (BjCj-9) OF NOVA SCOTIA. In R.J. Nash, MI'KMAQ: ECONOMICS AND EVOLUTION. Nova Scotia Museum, Curatorial Report #57.

Stewart, F.L. and P.W. Stahl. 1977. CAUTIONARY NOTE ON EDIBLE MEAT POUNDAGE FIGURES. American Antiquity 42(2):267-269.

Stoddard, T.L., R.H. Dyson, and N.B. Stoddard. 1952. AN ARCHAEOLOGICAL SURVEY OF THE NORTHEAST. SURVEY REPORTS FOR 1950, 1951, AND 1952. Ms. on file, Peabody Foundation for Archaeology, Andover, Mass.

Stoltman, J.B. 1978. TEMPORAL MODELS IN PREHISTORY. Current Anthropology 19:703-746.

Stucki, B. 1981. MODELS AND PALEOSETTING OF THE HOKO RIVER SITE. Paper presented at the 46th annual meeting of the Society for American Archaeology, San Diego, California.

Stuiver, M., and G.W. Pearson. 1986. HIGH-PRECISION CALIBRATION OF THE RADIOCARBON TIME SCALE AD 1950-500BC. Radiocarbon 28(2B):805-838.

Sutton, D. 1982. TOWARDS A RECOGNITION OF CONVERGENT CULTURAL ADAPTATIONS IN THE SUBARCTIC ZONE. Current Anthropology 23:77-97.

Taylor, R.E., and C.W. Meighan. 1978. CHRONOLOGIES IN NEW WORLD ARCHAEOLOGY. New York: Academic Press.

Thomas, M.L.H. (ed.). 1983a. MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Thomas, M.L.H. 1983b. METEOROLOGY. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Thomas, M.L.H. 1983c. SALT MARSH SYSTEMS. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Thomas, M.L.H., D.C. Arnold, and A.R. A. Taylor. 1983. ROCKY INTERTIDAL COMMUNITIES. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Trites, R.W., and C.J. Garrett. 1983. PHYSICAL OCEANOGRAPHY OF THE QUODDY REGION. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Tuck, J.A. 1982. PREHISTORIC ARCHAEOLOGY IN ATLANTIC CANADA SINCE 1975. Canadian Journal of Archaeology 6:201-218.

Tuck, J.A. 1984. MARITIME PROVINCES PREHISTORY. Ottawa: National Museum of Canada.

Turnbull, C.J. 1976. THE AUGUSTINE SITE: A MOUND FROM THE MARITIMES. Archaeology of Eastern North America 4:50-63.

Turnbull, C. J. 1981. GOOSEBERRY POINT SITE: PRELIMINARY REPORT. Ms. on file, Archaeological Services, New Brunswick Department of Tourism, Recreation and Heritage.

Turnbull, C.J. 1988. REFLECTIONS ON A GROUND SLATE BAYONET FRAGMENT FROM THE TANTRAMAR MARSH, UPPER BAY OF FUNDY. Canadian Journal of Archaeology 12:87-108.

****

LIVING CLOSE TO THE LEDGE

Turnbull, C.J., and P.M. Allen. 1988. REVIEW OF 'MARITIME PROVINCES PREHISTORY'. Canadian Journal of Archaeology 12:250-260.

Turnbull, C.J., and D.W. Black. 1988. THE SLATE ULU FROM WHITE HORSE ISLAND. In D.W. Black (ed.), BLISS REVISITED: PRELIMINARY ACCOUNTS OF THE BLISS ISLANDS ARCHAEOLOGY PROJECT, PHASE II. New Brunswick Department of Tourism, Recreation and Heritage, Manuscripts in Archaeology #24.

Turnbull, C.J., and S.A. Davis. 1986. AN ARCHAEOLOGICAL BIBLIOGRAPHY OF THE MARITIME PROVINCES. Council of Maritime Premiers, Reports in Archaeology #6.

Van Noten, F., D. Cahen and L. Keeley. 1980. A PALEOLITHIC CAMPSITE IN BELGIUM. Scientific American 242(4):48-55.

Virginia, R.A., and C.C. Delwiche. 1982. NATURAL 15N ABUNDANCE OF PRESUMED N2-FIXING AND NON-N2-FIXING PLANTS FROM SELECTED ECOSYSTEMS. Oecologia 54:317-325.

Wallis, W.D., and R.S. Wallis. 1957. THE MALICITE INDIANS OF NEW BRUNSWICK. National Museum of Canada, Bulletin #148.

Waselkov, G.A. 1982. SHELLFISH GATHERING AND SHELL MIDDEN ARCHAEOLOGY. PhD dissertation, Department of Anthropology, University of North Carolina at Chapel Hill.

Waselkov, G.A. 1987. SHELLFISH GATHERING AND SHELL MIDDEN ARCHAEOLOGY. In M.B. Schiffer (ed.), ADVANCES IN ARCHAEOLOGICAL METHOD AND THEORY, vol. 10. New York: Academic Press.

Wessen, G.C. 1982. SHELL MIDDENS AS CULTURAL DEPOSITS: A CASE STUDY FROM OZETTE. PhD dissertation, Department of Anthropology, Washington State University.

Wherry, J.A. 1981. DOCUMENTS RELATING TO THE HISTORY OF THE PASSAMAQUODDY INDIAN PRESENCE IN CHARLOTTE COUNTY, NEW BRUNSWICK. Fredericton: Arctician Books.

White, T.E. 1953. A METHOD OF CALCULATING THE DIETARY PERCENTAGE OF VARIOUS FOOD ANIMALS UTILIZED BY ABORIGINAL PEOPLES. American Antiquity 4:396-398.

Wildesen, L.E. 1982. THE STUDY OF IMPACTS ON ARCHAEOLOGICAL SITES. In M.B. Schiffer (ed.), ADVANCES IN ARCHAEOLOGICAL METHOD AND THEORY, vol. 5. New York: Academic Press.

Wildish, D.J. 1983. SUBLITTORAL SEDIMENTARY SUBSTRATES. In M.L.H. Thomas (ed.), MARINE AND COASTAL SYSTEMS OF THE QUODDY REGION, NEW BRUNSWICK. Canadian Special Publication of Fisheries and Aquatic Sciences #64. Ottawa: Fisheries and Oceans.

Willey, G.R. 1966. AN INTRODUCTION TO AMERICAN ARCHAEOLOGY, vol. 1: NORTH AND MIDDLE AMERICA. Chicago: University of Chicago Press.

Willey, G.R., and P. Phillips. 1958. METHOD AND THEORY IN AMERICAN ARCHAEOLOGY. Chicago: University of Chicago Press.

Wilson, L. 1983. LITHICS ANALYSIS OF SELECTED NEW BRUNSWICK ARCHAEOLOGICAL SITES. B.A. honors thesis, Department of Anthropology, University of New Brunswick.

Winterhalder, B., and E.A. Smith (eds.). 1981. HUNTER-GATHERER FORAGING STRATEGIES. ETHNOLOGICAL AND ARCHAEOLOGICAL ANALYSES. Chicago: University of Chicago Press.

Wright, J.V. 1966. THE ONTARIO IROQUOIS TRADITION. Ottawa: National Museum of Canada.

Wright, J.V. 1979. QUEBEC PREHISTORY. Toronto: Van Nostrand Reinhold.

Yesner, D.R. 1977. PREHISTORIC SUBSISTENCE AND SETTLEMENT IN THE ALEUTIAN ISLANDS. PhD dissertation, Department of Anthropology, University of Connecticut.

Yesner, D.R. 1980. MARITIME HUNTER-GATHERERS, ECOLOGY AND PREHISTORY. Current Anthropology 21:727-750.

Yesner, D.R. 1983. ON EXPLAINING CHANGES IN PREHISTORIC COASTAL ECONOMIES: THE VIEW FROM CASCO BAY. In R.J. Nash (ed.), THE EVOLUTION OF MARITIME CULTURES ON THE NORTHEAST AND THE NORTHWEST COASTS OF AMERICA. Simon Fraser University, Department of Archaeology, Publication #11.

Zipf, G.K. 1949. HUMAN BEHAVIOUR AND THE PRINCIPLE OF LEAST EFFORT. Cambridge, Mass.: Addison-Wesley.

****

LIVING CLOSE TO THE LEDGE

APPENDIX A:

Supplementary Information for Chapters 2 and 3.

FIGURE A-1: Map of the Weir site. See Figure A-19 for the key.

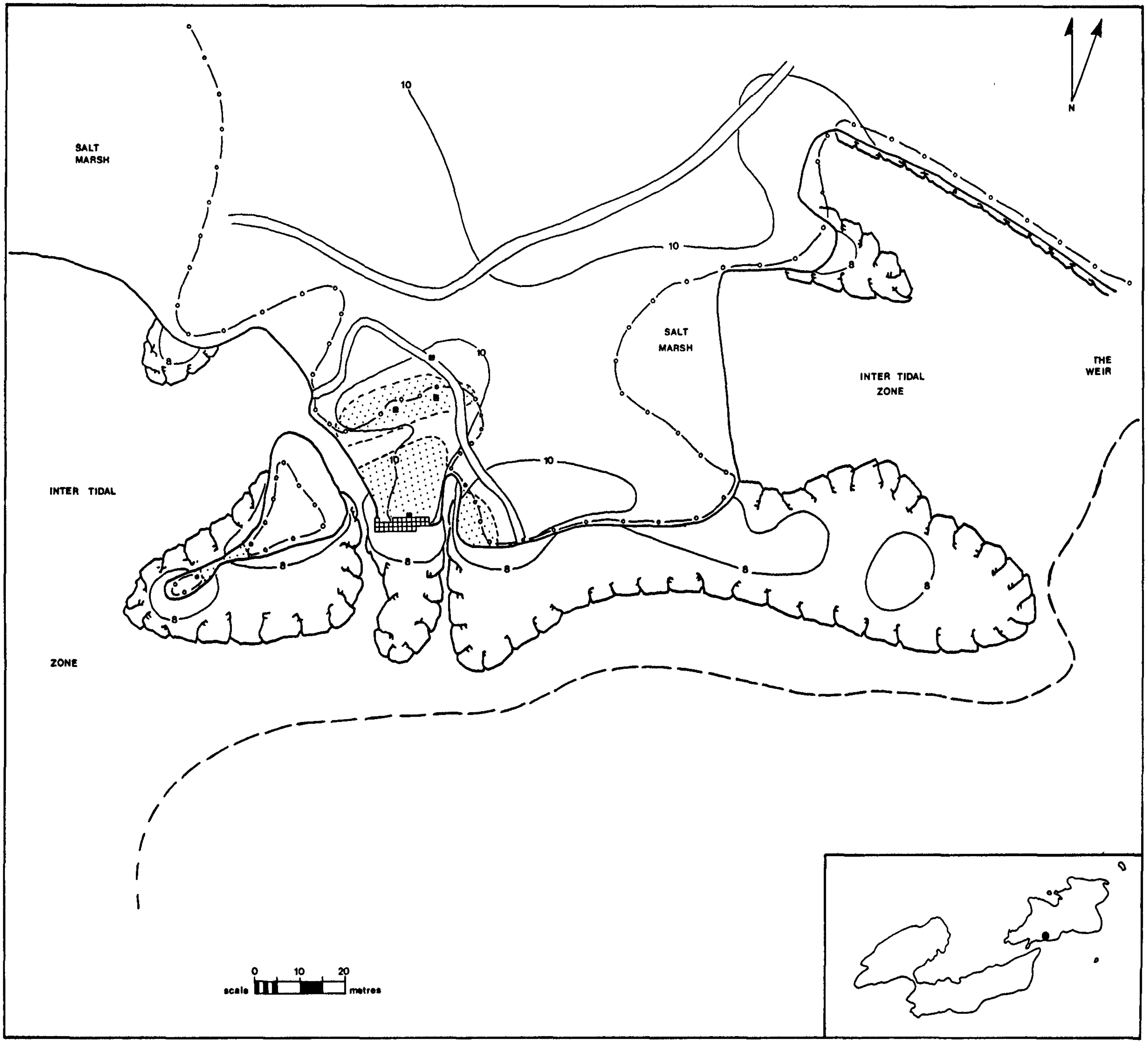

N
SALT MARSH
10
SALT MARSH
INTER TIDAL ZONE
THE WEIR
INTER TIDAL
ZONE
8
scale
0
10
20
metres

FIGURE A-2: Plan of the excavation block at the Weir site. See Figure A-21 for the key.

WEIR SITE: MAIN EXCAVATION BLOCK PROVENIENCE UNITS

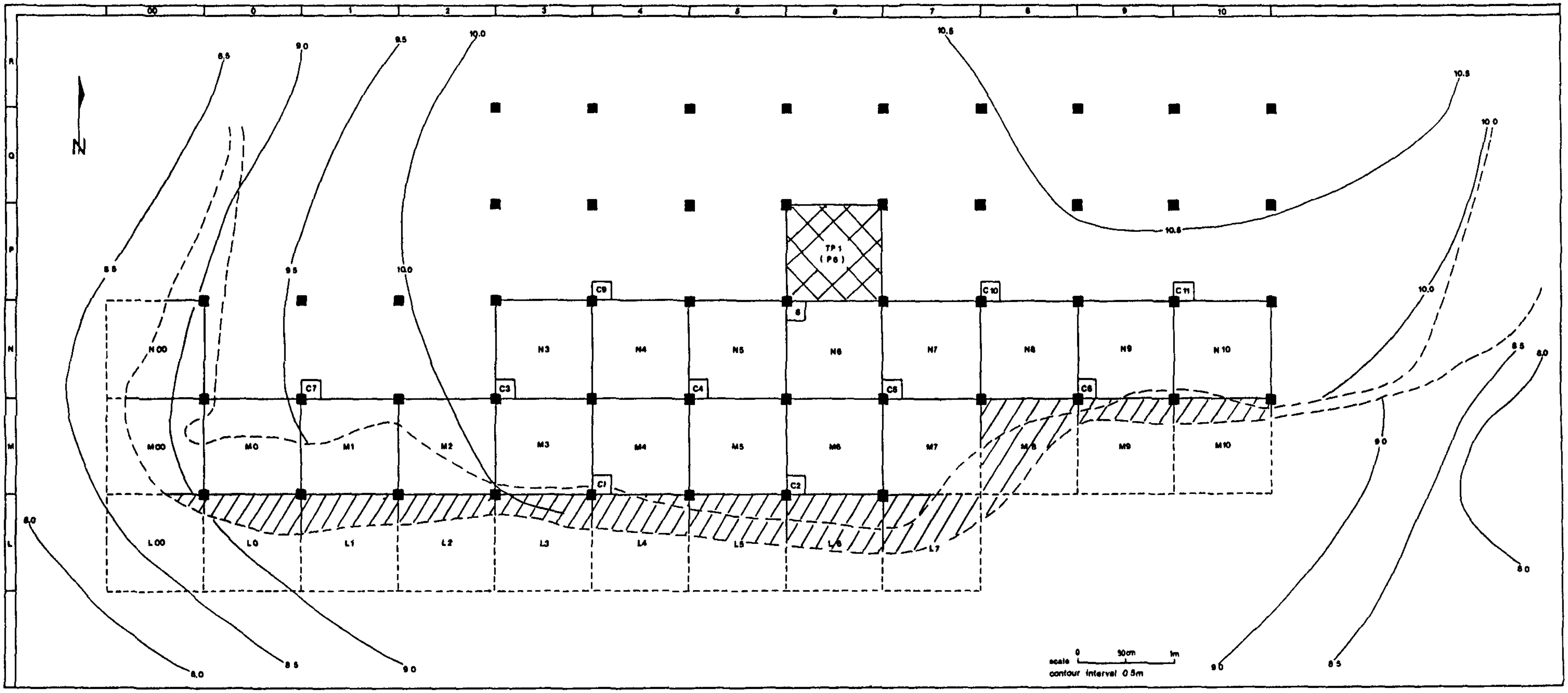
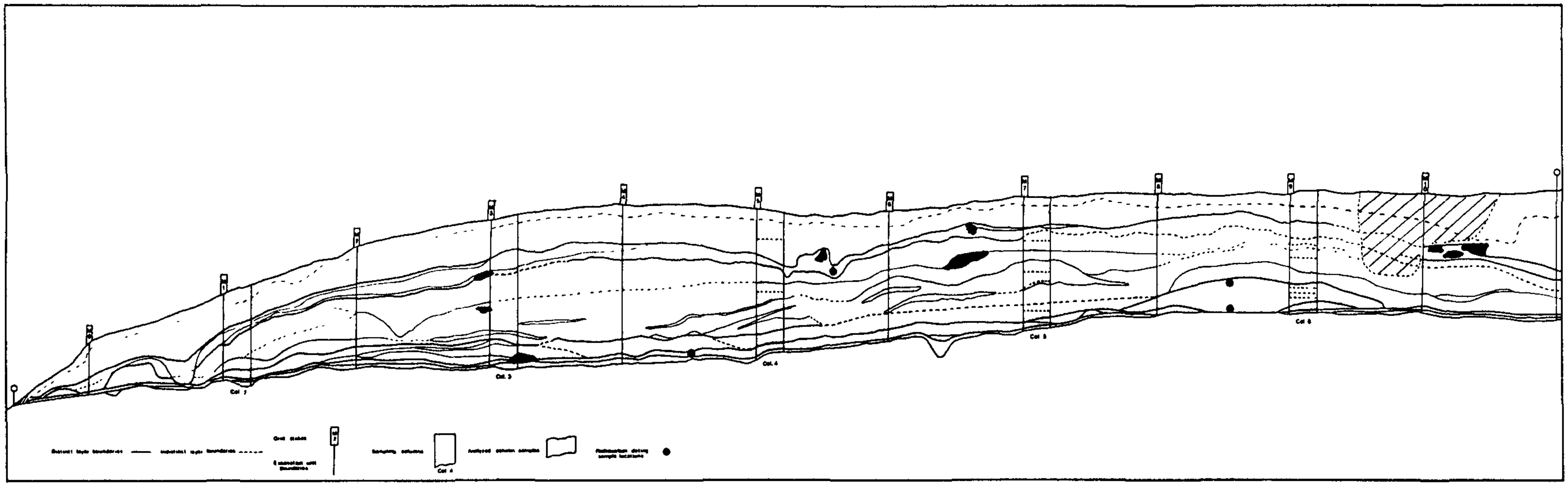


FIGURE A-3: Profile of the Weir site showing the locations of column samples and radiocarbon dates processed for this study.



Col 7
Col 3
Col 4
Col 5
Col 6

FIGURE A-4: Profile of the Weir site showing the stratigraphic components defined as analytical units for this study. This profile follows the M0-M11 line shown in Figure A-2.

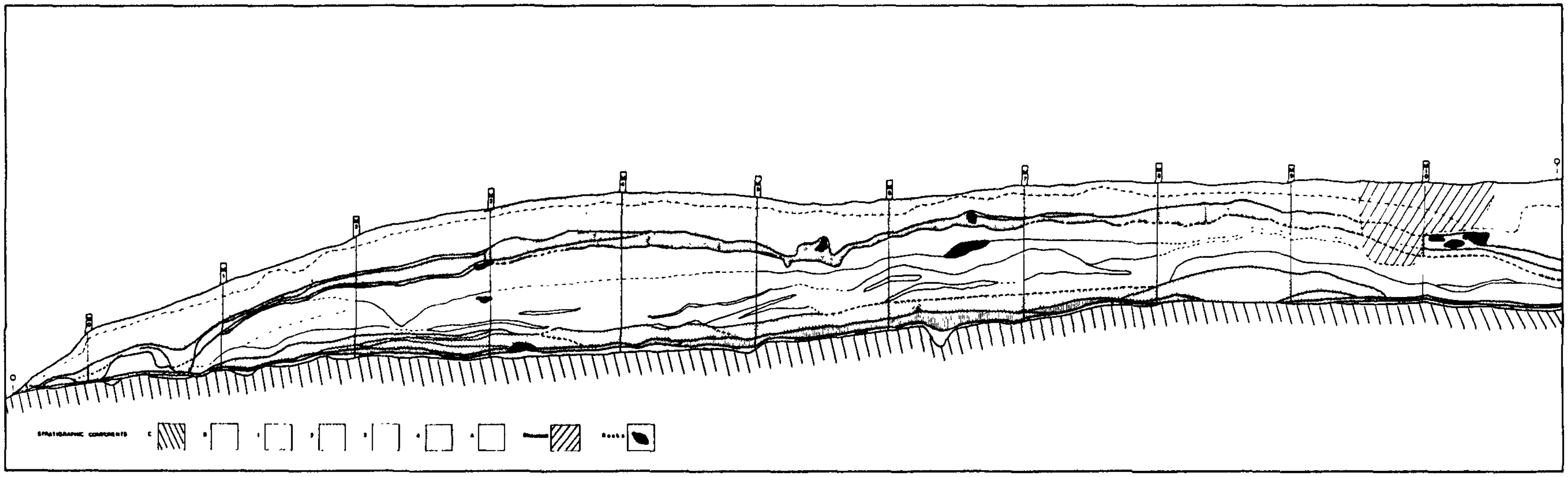

STRATIGRAPHIC COMPONENTS
C
4
Rocks

FIGURE A-5: Schematic stratigraphic diagram of the Weir site. Stippled areas correspond to the stratigraphic components shown in Figures A-4 and A-6.

****
LIVING CLOSE TO THE LEDGE

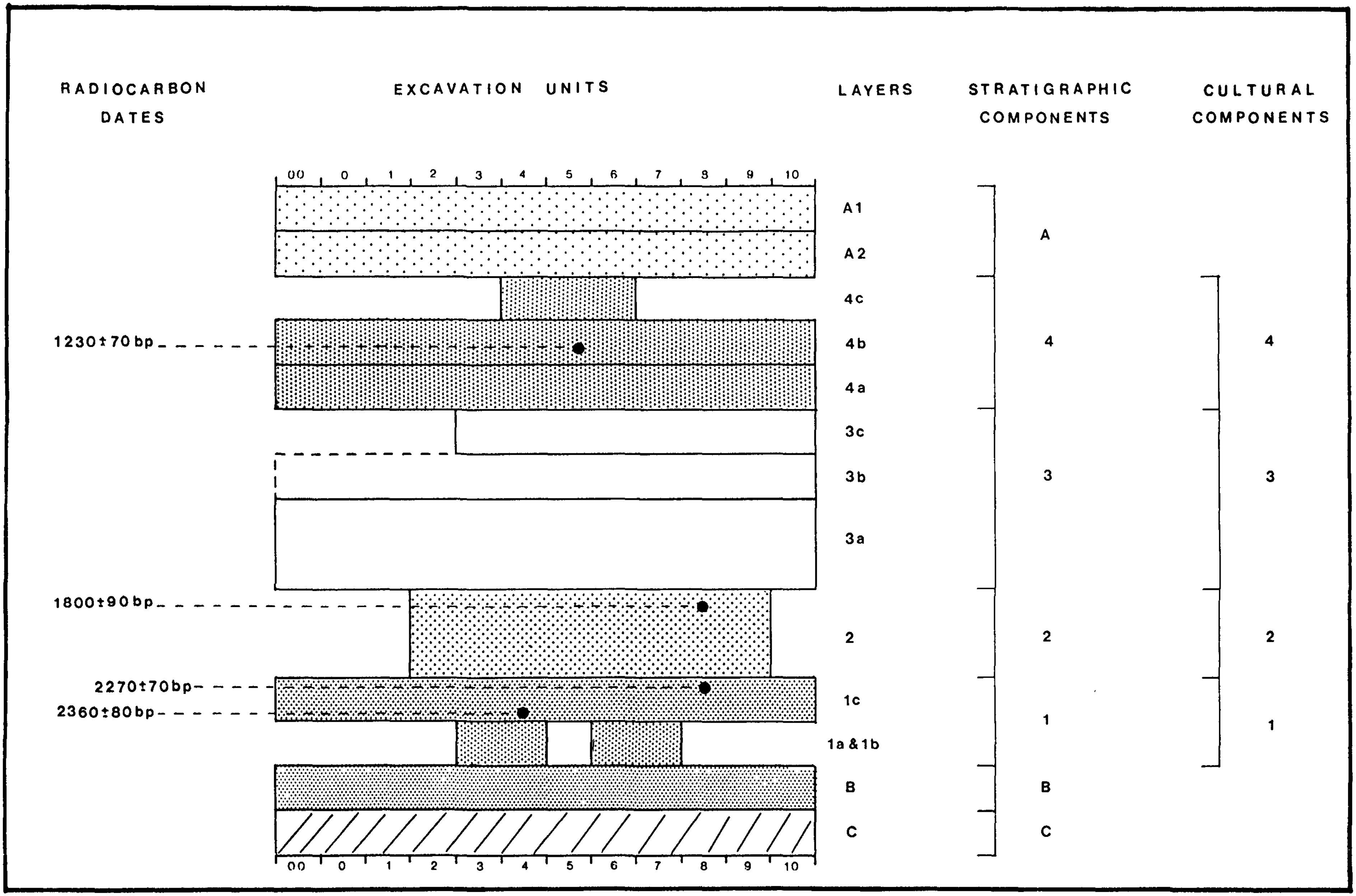

RADIOCARBON DATES
EXCAVATION UNITS
LAYERS
STRATIGRAPHIC COMPONENTS
CULTURAL COMPONENTS
00 0 1 2 3 4 5 6 7 8 9 10
A1
A2
A
4c
1230±70 bp
4b
4a
4
4
3c
3b
3a
3
3
1800±90 bp
2
2
2
2270±70 bp
2360±80 bp
1c
1a & 1b
1
1
B
B
C
C
00 0 1 2 3 4 5 6 7 8 9 10

FIGURE A-6: Triangular co-ordinate graph showing the composition of the stratigraphic components at the Weir site. Stippled areas correspond to the stratigraphic components shown in Figures A-4 and A-5.

****
LIVING CLOSE TO THE LEDGE

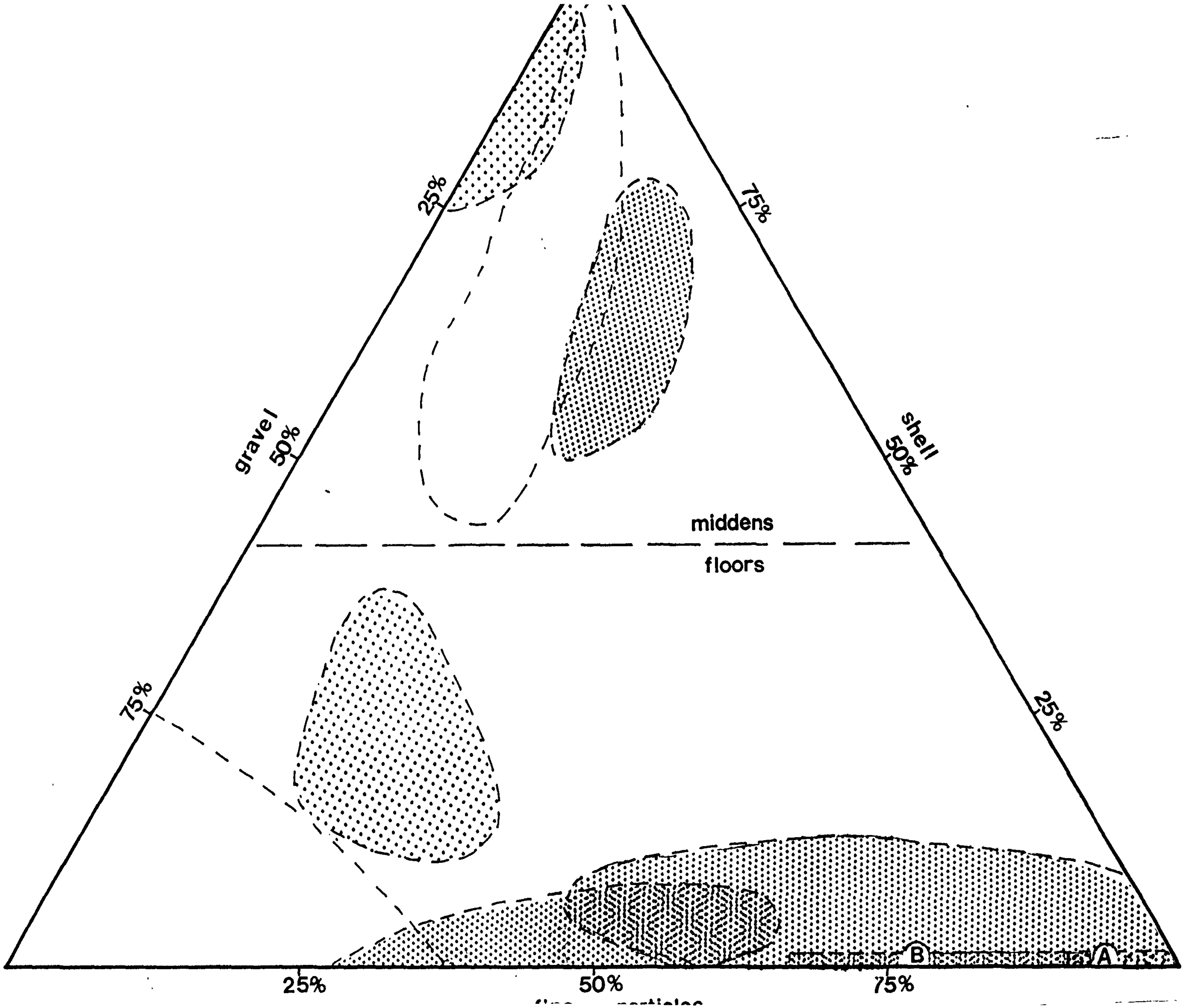
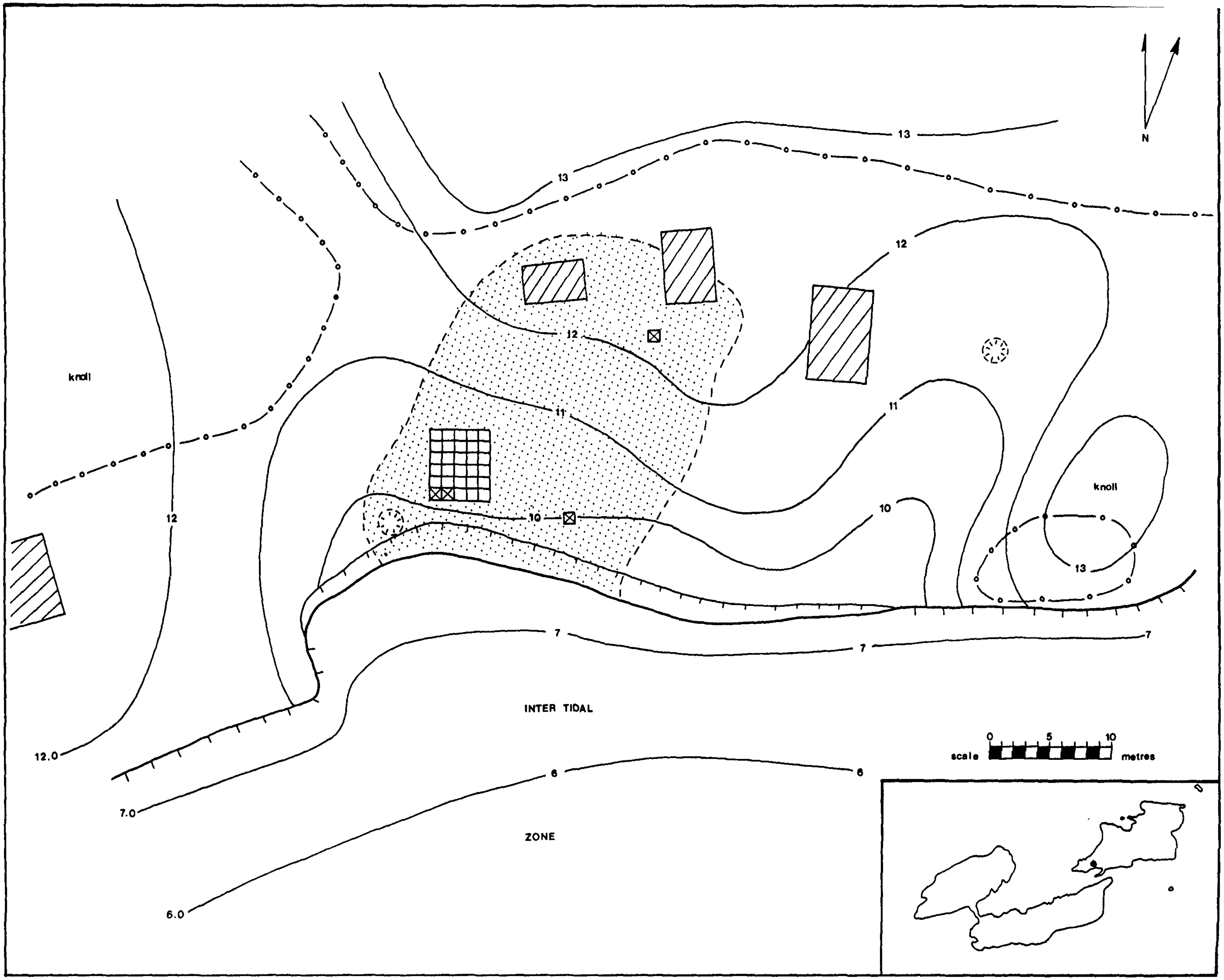

gravel
25%
50%
75%
shell
75%
50%
25%
middens
floors
25%
50%
75%
A
B

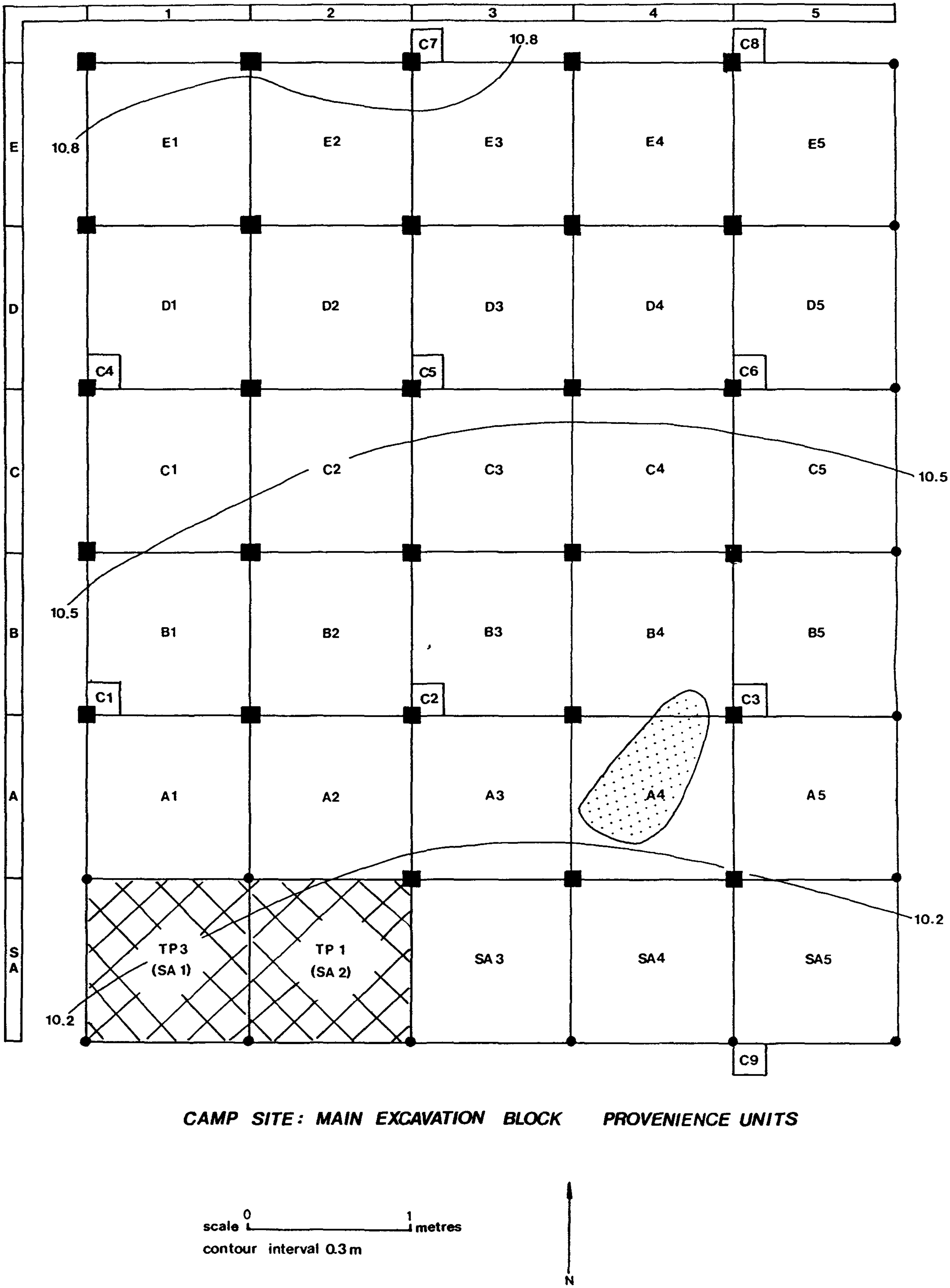
FIGURE A-7: Map of the Camp site. See Figure A-19 for the key.



N
13
13
12
12
11
11
10
10
13
knoll
knoll
12
12.0
7
7
7
7.0
6
6
6.0
INTER TIDAL
ZONE
scale
0
5
10
metres

FIGURE A-8: Plan of the excavation block at the Camp site. See Figure A-21 for the key.

****
LIVING CLOSE TO THE LEDGE



CAMP SITE: MAIN EXCAVATION BLOCK PROVENIENCE UNITS

FIGURE A-9: Profile of the Camp site showing the layers identified during the excavation.

Camp Site' Main Excavation Block, East Profile

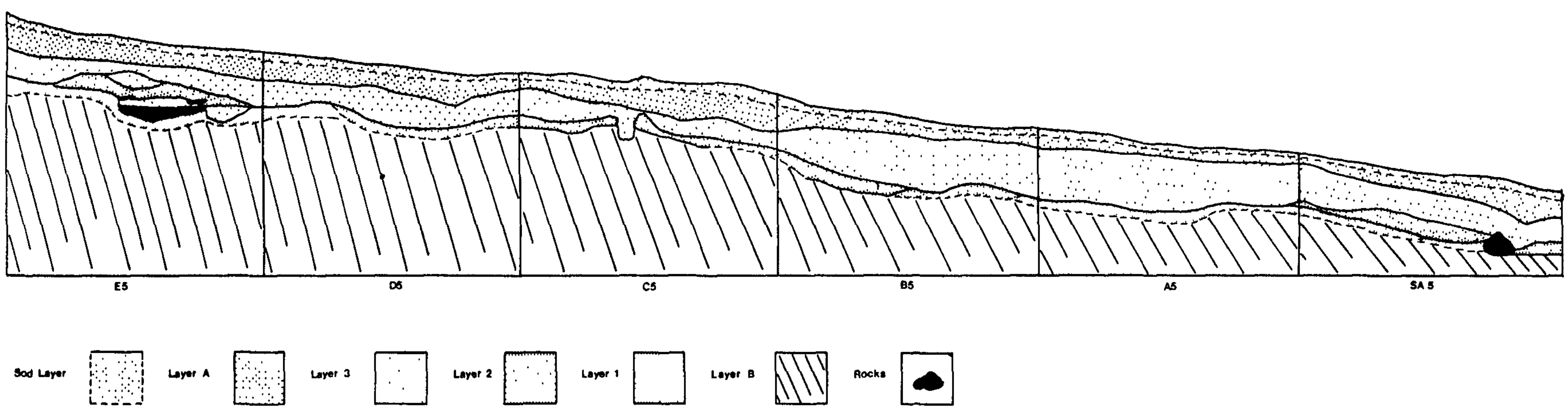


FIGURE A-10: Schematic stratigraphic diagram of the Camp site. Stippled areas correspond to the layers shown in Figures A-9 and A-11.

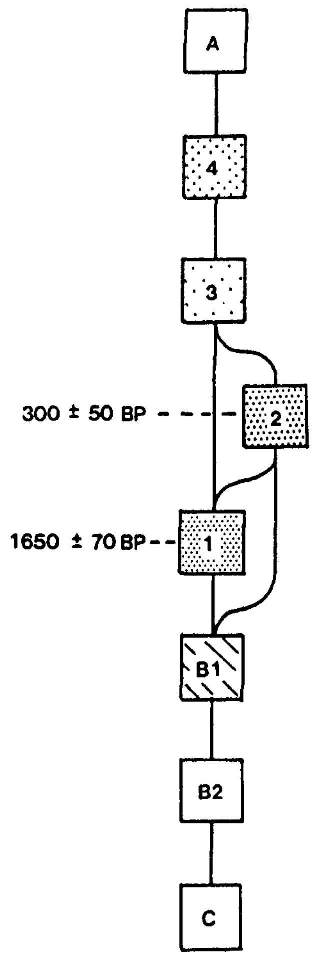
SEQUENCE	DEPOSITS		INTERPRETATIONS
			
	A/ black humic soil; sod, rootmat	→	historic occupation and disturbance; recent soil development
	4/ black humic worm-sorted soil; rocks; roots; 10–20% marine shell	→	cultural occupation and feature construction; historic disturbance; pedogenesis
	3/ black humic worm-sorted soil; roots; 20–70% marine shell	→	cultural occupation; shellfish harvesting and deposition; pedogenesis
	2/ black humic soil; gravel; rocks; roots; traces of marine shell	→	cultural occupation; living floor construction; pedogenesis
	1/ mottled black + red-brown mineral soil; roots	→	cultural occupation; pedogenesis
	B1/ dense light brown clay subsoil; roots	→	glaciomarine deposition; pedogenesis
	B2/ yellow-red silty subsoil	→	glaciomarine deposition
	C/ fragmented red fine conglomerate bedrock	→	weathering of geological formation

FIGURE A-11: Triangular co-ordinate graph showing the composition of the layers in the Camp site. Stippled areas correspond to the layers shown in Figures A-9 and A-10.

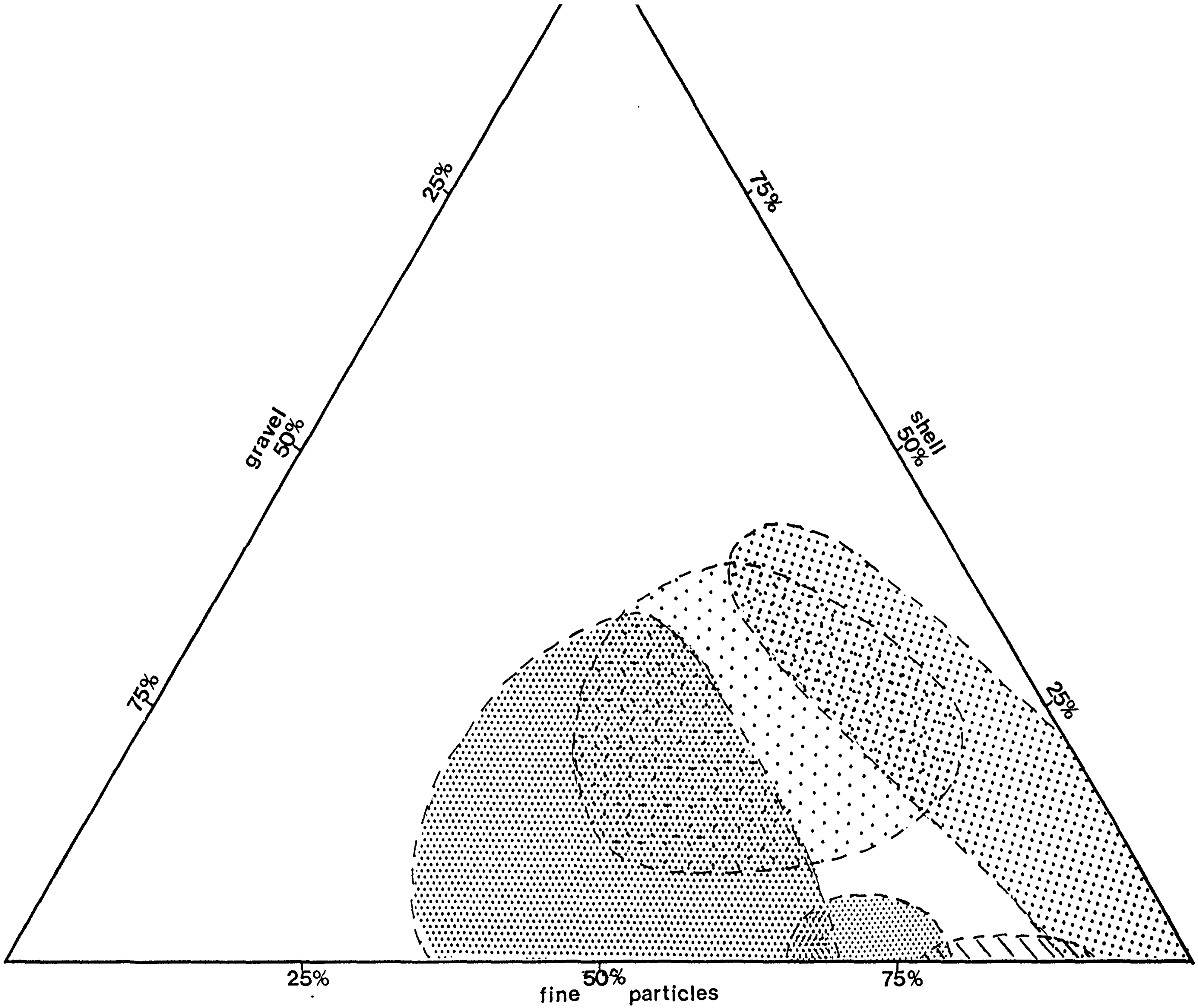

gravel
25%
50%
75%
shell
75%
50%
25%
fine particles
25%
50%
75%

FIGURE A-12: Plan of the Camp site excavation block showing the areas compared in this study, and the locations of the radiocarbon dates processed for this study.

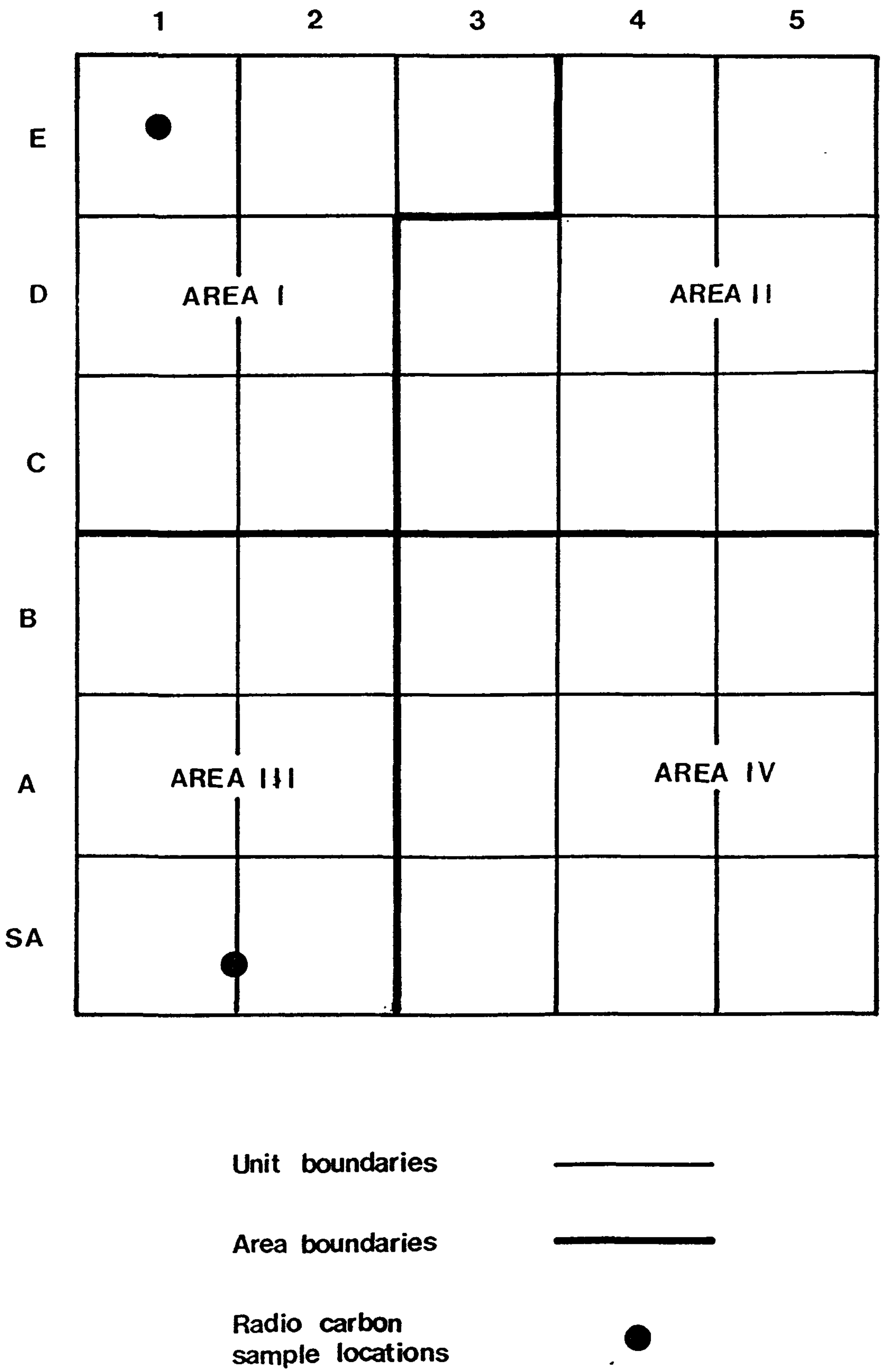

1
2
3
4
5
E
D
C
B
A
SA
AREA I
AREA II
AREA III
AREA IV
Unit boundaries
Area boundaries
Radio carbon sample locations

FIGURE A-13: Map of the Northeast Point site. See Figure A-20 for the key.

****
LIVING CLOSE TO THE LEDGE

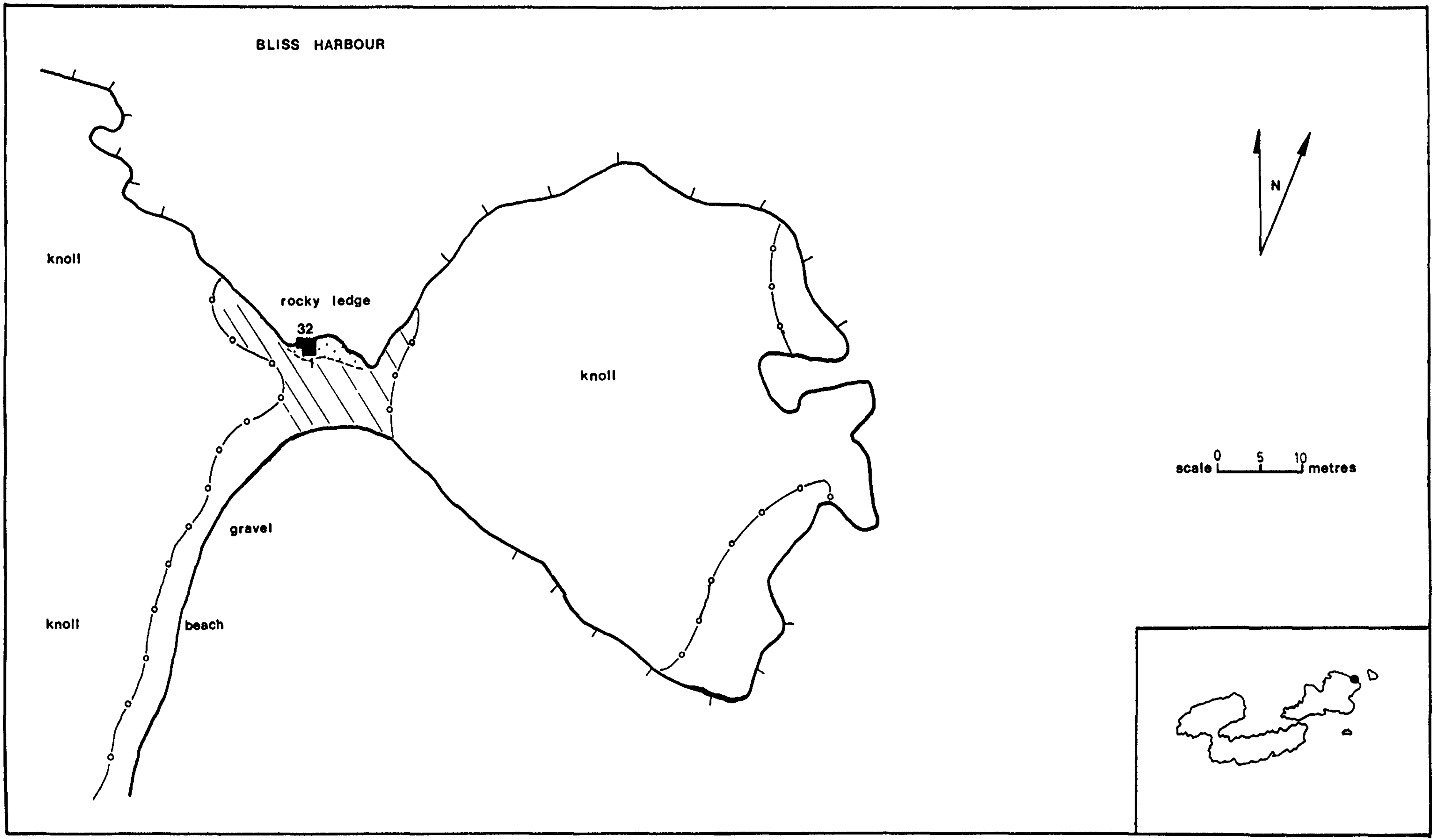
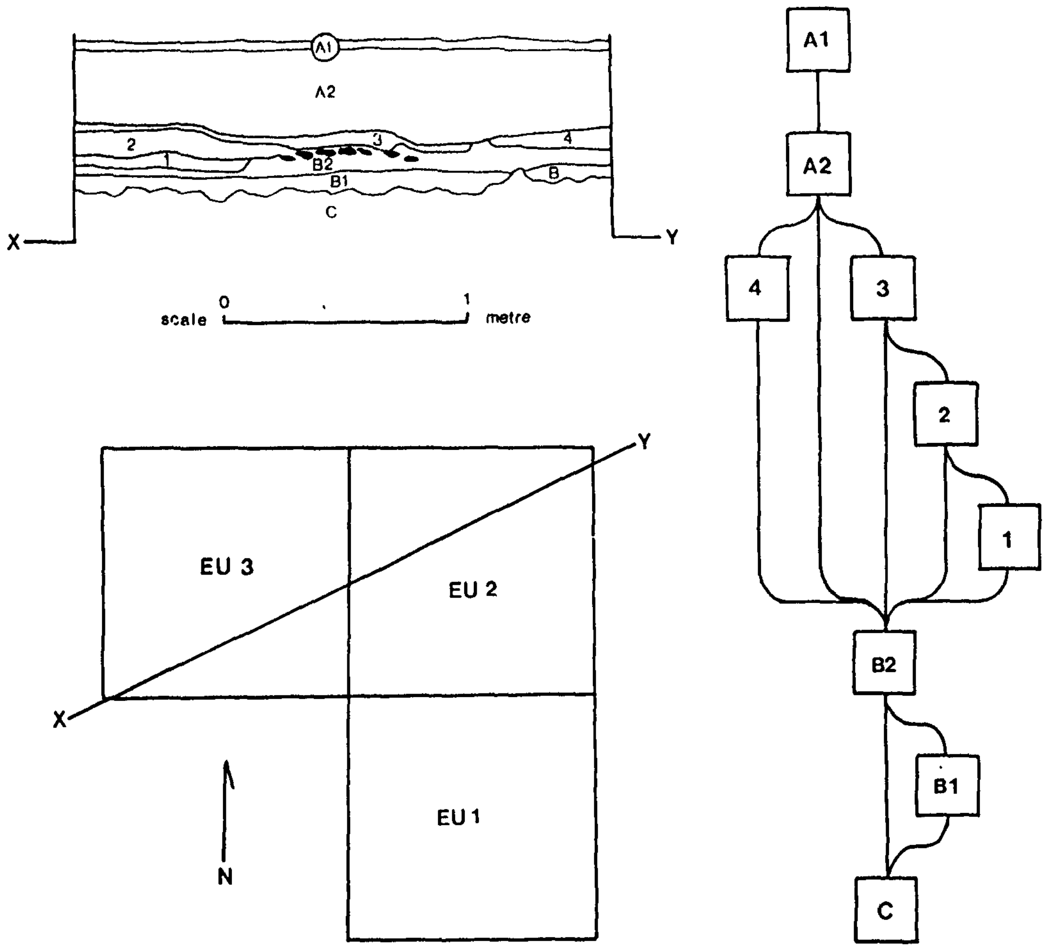

BLISS HARBOUR
knoll
rocky ledge
32
1
knoll
gravel
knoll
beach
N
scale 0 5 10 metres

FIGURE A-14: Profile drawing and schematic stratigraphic diagram of the Northeast Point site.

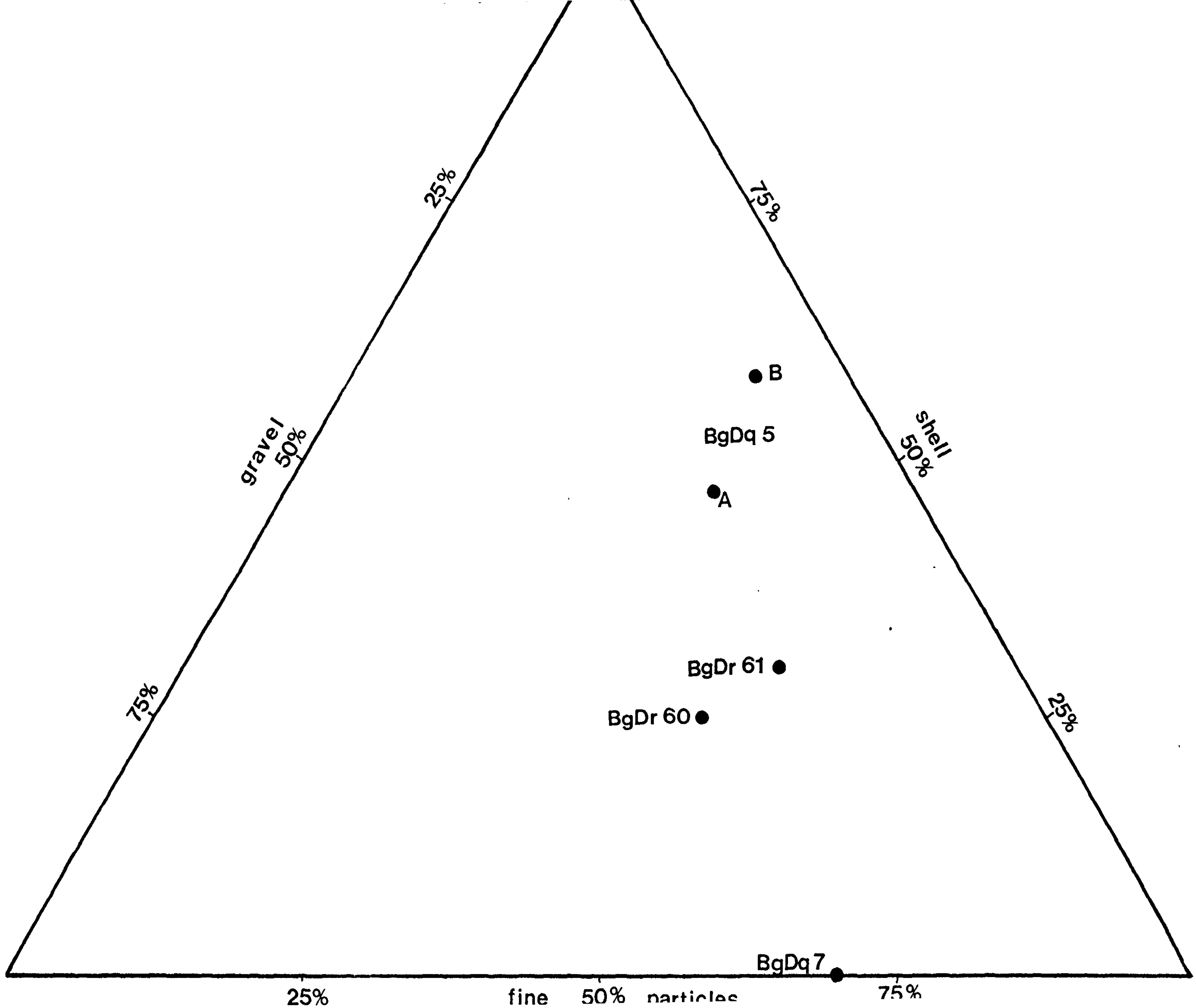
****
LIVING CLOSE TO THE LEDGE



DEPOSITS			INTERPRETATIONS
A1/	loose brown peat soil and rootmat	⟶	modern soil deposit
A2/	compact dark red peat soil	⟶	peat deposition
4/	grey rounded beach gravel	⟶	living-floor construction
3/	black greasy humic soil and charcoal	⟶	living-floor occupation
2/	black greasy humic soil	⟶	living-floor occupation
1/	grey rounded beach gravel	⟶	living-floor construction
B2/	dark brown greasy humic soil	⟶	formation of natural soil A horizon
B1/	pinkish-gray clay soil	⟶	Pleistocene glacio-marine deposition
C/	conglomerate bedrock	⟶	geological deposition

FIGURE A-15: Triangular co-ordinate graph showing the composition of the occupation layers in the Northeast Point, Lighthouse Cove, Pintlowes Cove, and Ledge sites.

****
LIVING CLOSE TO THE LEDGE



25%
gravel
50%
75%
75%
shell
50%
25%
B
BgDq 5
A
BgDr 61
BgDr 60
BgDq 7
25%
fine
50%
particles
75%

FIGURE A-16: Map of the Lighthouse Cove site. See Figure A-20 for the key.

****
LIVING CLOSE TO THE LEDGE

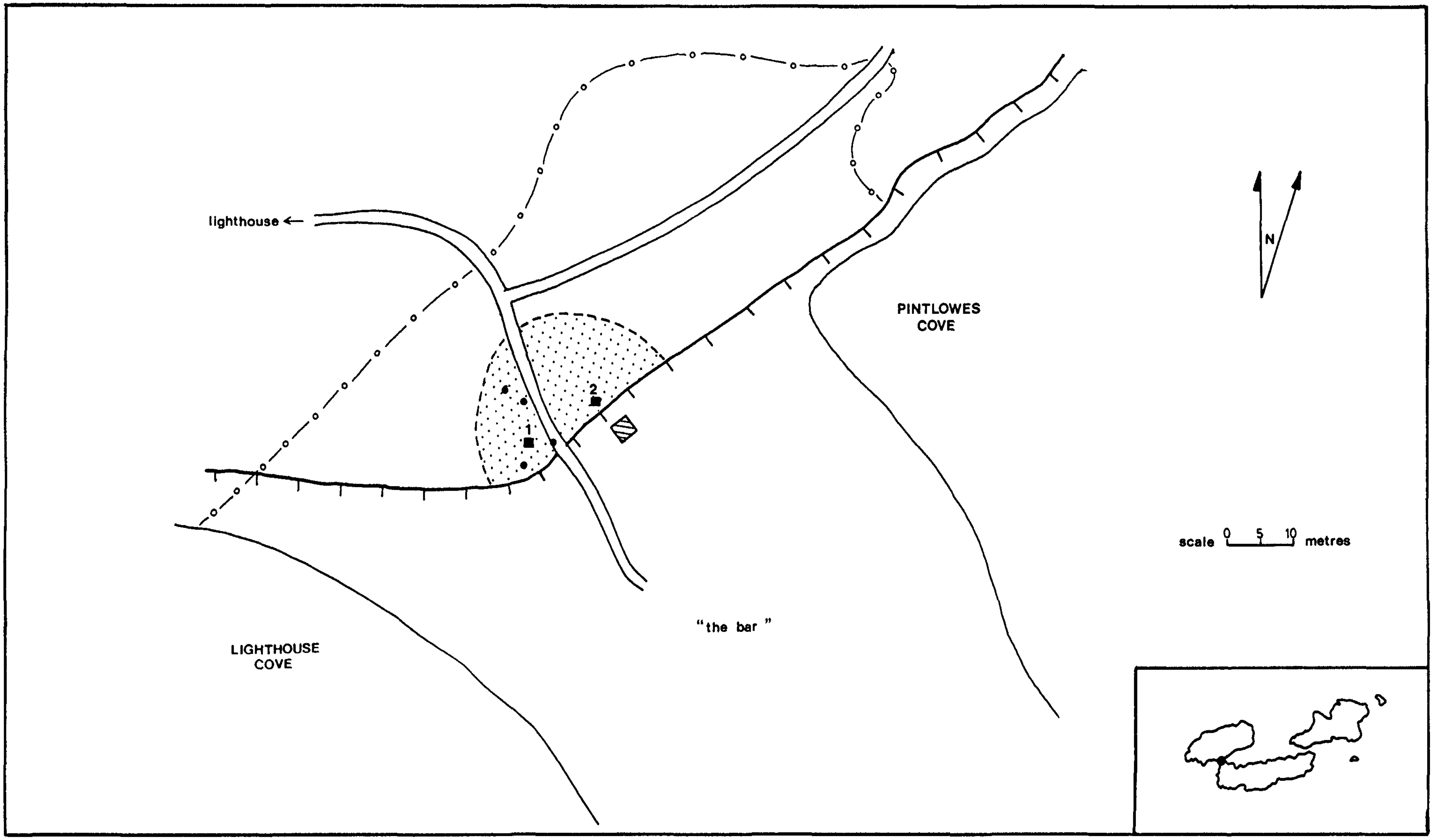

lighthouse ←
N
PINTLOWES
COVE
1
2
scale 0 5 10 metres
"the bar"
LIGHTHOUSE
COVE

FIGURE A-17: Map of the Pintlowes Cove site. See Figure A-20 for the key.

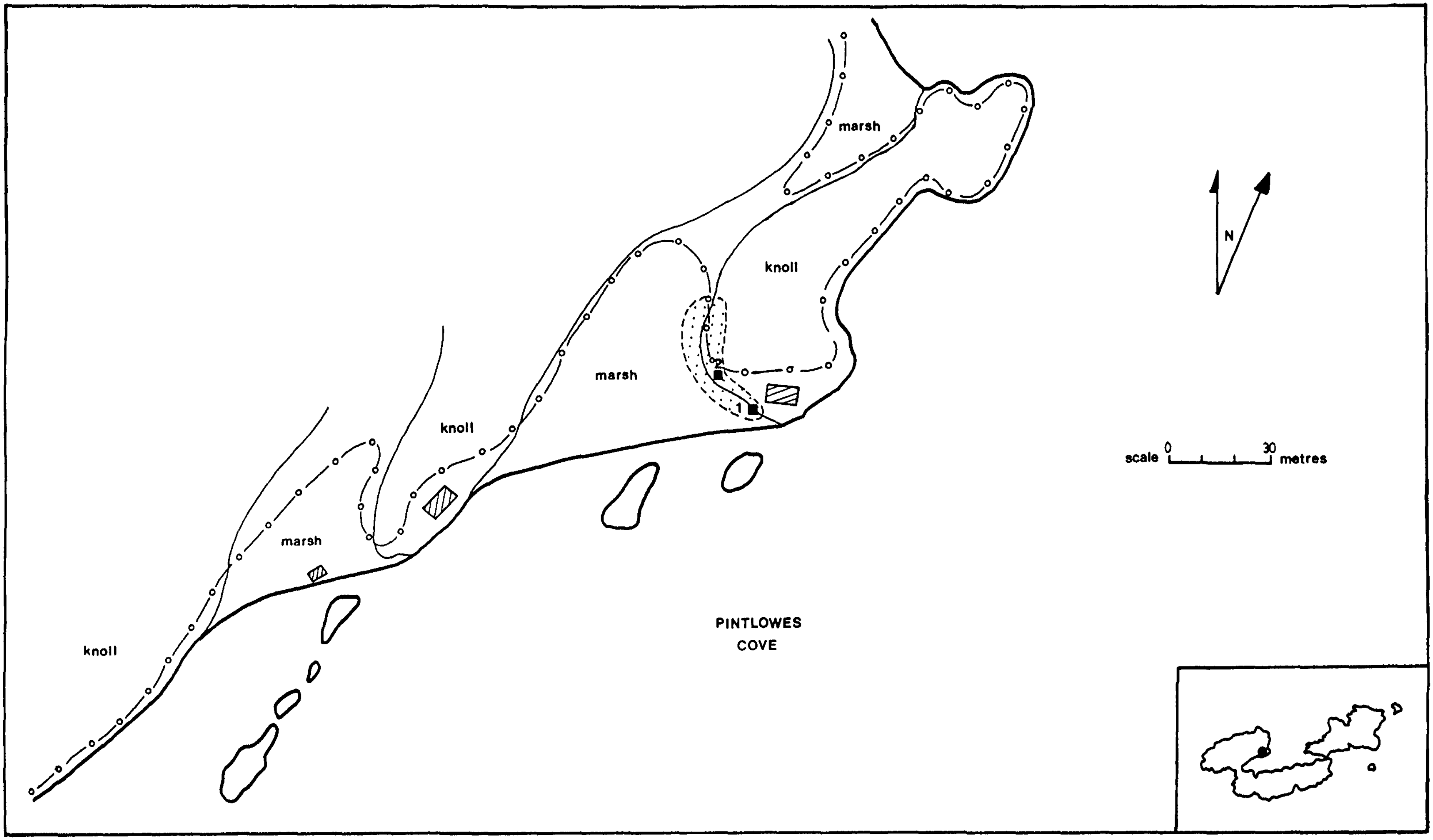

marsh
knoll
marsh
knoll
marsh
knoll
1
2
N
scale 0 30 metres
PINTLOWES
COVE

FIGURE A-18: Map of the Ledge site. See Figure A-20 for the key.

****
LIVING CLOSE TO THE LEDGE

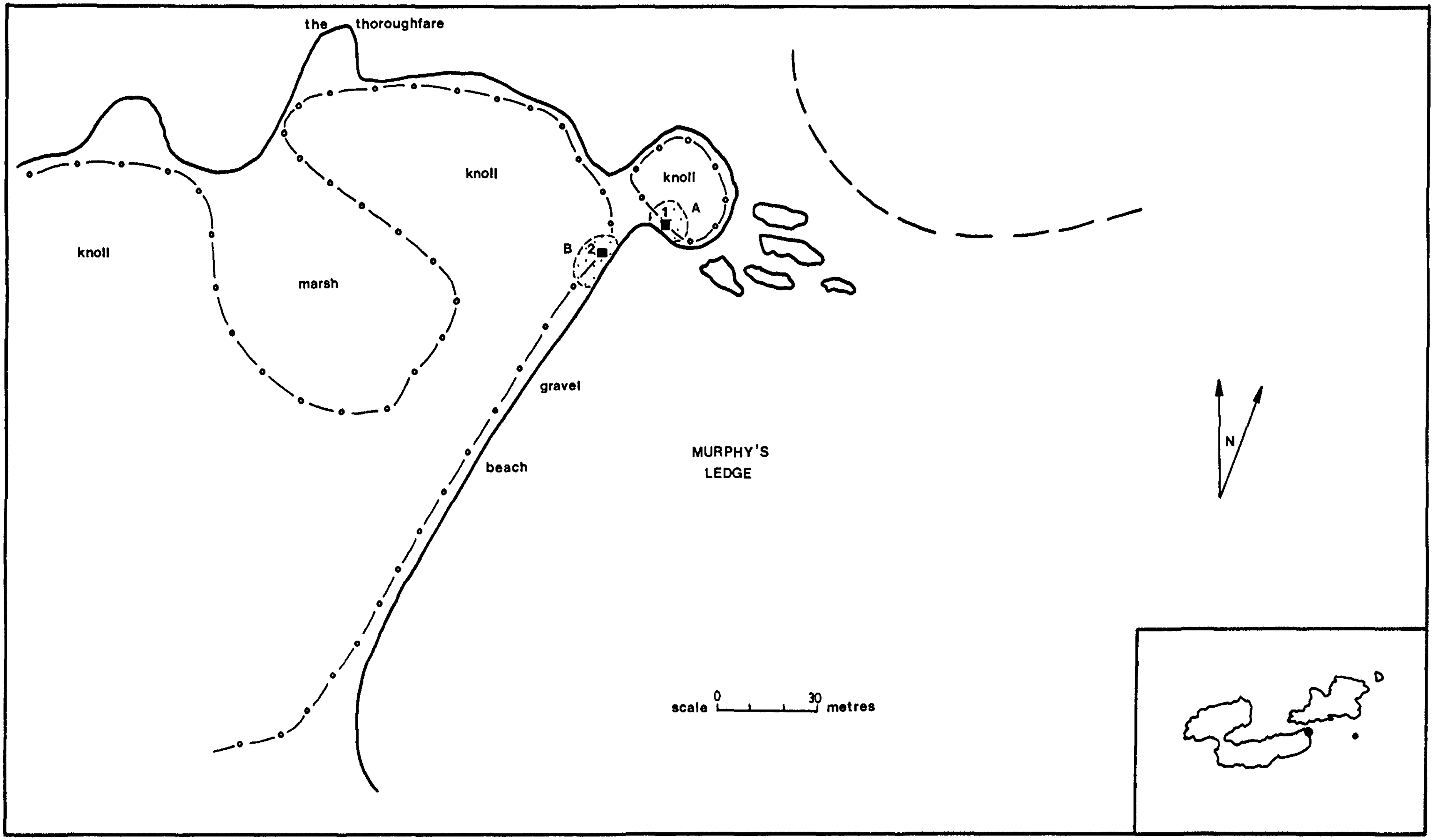

the thoroughfare
knoll
knoll
knoll
marsh
A
B
1
2
gravel
beach
MURPHY'S
LEDGE
N
scale 0 30 metres

FIGURE A-19: Key to Figures A-1 and A-7.

KEY TO LARGE SITE MAPS

High water line

Low water line

Intertidal outcrops

Tree line

Trails

Contour lines 8

Shell midden

1983 Test units

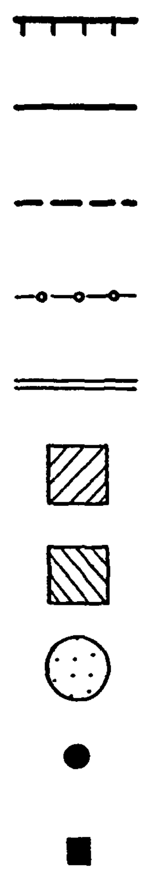
1986 Excavation Block

Elevations in metres above marine chart datum

FIGURE A-20: Key to Figures A-13, A-16, A-17 and A-18.

****
LIVING CLOSE TO THE LEDGE

KEY TO SITE MAPS

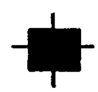


- Cliff line
- Highwater line
- Lowwater line
- Tree line
- Trails
- Buildings
- Peat deposit
- Site
- Shovel tests
- Test units

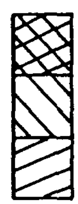
FIGURE A-21: Key to Figures A-2 and A-8.

KEY TO EXCAVATION PLANS

Eroded edge of site – – – – – – – – (top of slope)
– – – – – – – – (bottom of slope)

Grid stake 

Column sample [C1]



Excavated by natural & arbitrary levels (1983)

Excavated by natural layers (1986)

Shovelled and screened (1986)

Elevations in metres above marine chart datum

PLATE A-1: The Weir site and environs. The site is located beneath the low vegetation at the left end of the bedrock outcrop.

PLATE A-2: Profile of the Weir site showing the complexity and distinctness of the stratification in the site. This profile follows the M0-M3-N3-N11 line shown on Figure A-2.

PLATE A-3: The Camp site and environs. The site is located on the sloping open area in front of the tents and cabins.

****
LIVING CLOSE TO THE LEDGE

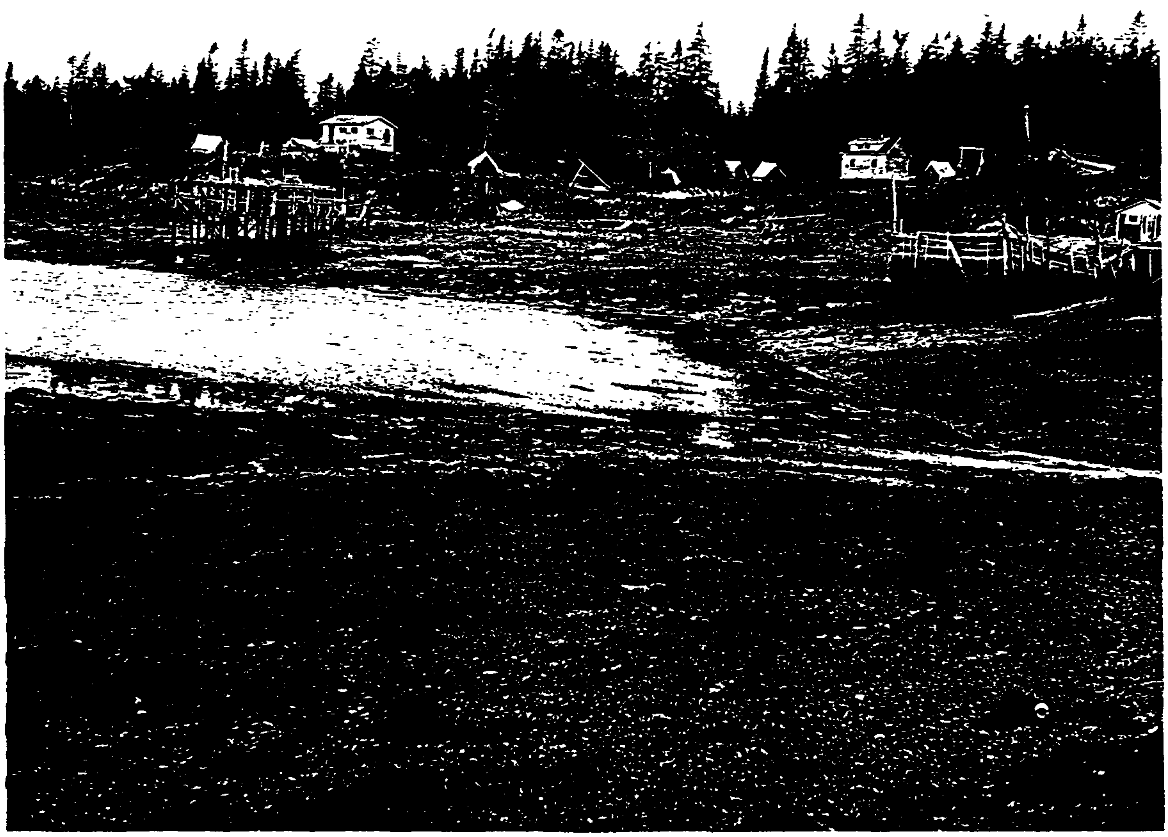


PLATE A-4: The Northeast Point site and environs. The site is located beneath the low vegetation at the head of the small cove.

Blank page inserted to maintain continuity.

APPENDIX B:

Supplementary Information for Chapter 4.

TABLE B-1: Quoddy region archaeological radiocarbon dates.

	Site Number:	Site Name:	Lab Number:	Date:	Material:
01.	BhDt4	Simpson's Farm	B11067	740+/-60	shell
02.	BgDs1	Pagan Point	Y1291	1880+/-80	charcoal
03.	DgDs4	Eidlitz	Gak1888	1290+/-80	"
04.	BgDs6	Sandy Point	Y1292	1900+/-100	"
05.			S617	1720+/-335	"
06.			S618	1410+/-90	"
07.	BgDs10	Minister's Is.	Y1293	2370+/-80	"
08.			B21263	1930+/-110	matting
09.			B20873	1840+/-60	charcoal
10.			GSC1674	1060+/-140	"
11.			GSC1581	900+/-180	"
12.			GSC1445	650+/-130	shell
13.			GSC1580	580+/-120	charcoal
14.			GSC1547	410+/-130	shell
15.	BhDr1	McAleenan	GSC1313	680+/-160	charcoal
16.			GSC1292	450+/-130	shell
17.	BgDr2	Pickering	B1223	2334+/-110	charcoal
18.	BgDr5	Carson	SI2187	1120+/-65	"
19.			S510	925+/-80	"
20.			SI2186	420+/-90	"
21.	BgDr11	Teacher's Cv.	S609	1635+/-60	shell
22.			S608	1170+/-100	charcoal
23.	BgDr38	Pendleton Ps.	B8199	1620+/-70	shell
24.	BgDr48	Partridge Is.	S2215	2400+/-105	charcoal
25.			I12,382	1880+/-80	"
26.			I12,381	1650+/-80	"
27.			B3968	1550+/-50	"
28.	BfDr3	Gooseberry Pt.	B4190	660+/-50	"
29.	BgDq4	Camp site	B21138	1650+/-70	charcoal
30.			B8196	300+/-50	"
31.	BgDq5	Ledge site	B8197	380+/-50	"
32.	BgDq6	Weir site	B23159	2360+/-80	"
33.			B21141	2270+/-70	"
34.			B21139	1800+/-90	"
35.			B8198	1280+/-60	"
36.			B21140	1230+/-70	"
37.	BgDq7	Northeast Pt.	B23160	1500+/-70	"

TABLE B-2: Quoddy region archaeological site inventory by subregion and site type.

Location:	PBM	BFM	PBI	BFI	WIN	WIS	BBS	GMW	Totals:	Proportions:
Site Type:										
1a	4	3	1	0	5	1	3	0	17	0.12
1b	6	0	1	0	6	0	3	2	18	0.13
2	0	0	2	0	1	0	0	1	4	0.03
3	9	5	2	0	8	2	8	0	34	0.24
4a	1	1	0	0	0	4	1	0	7	0.05
4b	0	0	0	0	0	0	0	0	0	0.00
5	4	1	4	0	5	2	5	8	29	0.20
6	22	1	7	0	1	0	2	0	33	0.23
Totals:	46	11	17	0	26	9	22	11	142	1.00
Proportions:	0.32	0.07	0.11	0.00	0.18	0.06	0.15	0.07	1.00	

Subregions:

PBM -- Passamaquoddy Bay Mainland
BFM -- Bay of Fundy Mainland
PBI -- Passamaquoddy Bay Islands
BFI -- Bay of Fundy Islands
WIN -- Northern West Isles
WIS -- Southern West Isles
BBS -- Back Bay Shelf
GMW -- Grand Manan and the Wolves

Site Types:

1a -- prehistoric shell midden
1b -- multi-component shell midden
2 -- historic shell midden
3 -- unknown shell midden
4a -- prehistoric non-shell site
4b -- multi-component non-shell site
5 -- historic non-shell site
6 -- unknown non-shell site

TABLE B-3: Distribution of Quoddy region archaeological sites and random points by shoreline segment types.

Shoreline Segment Types:	Point/Headland:	Open shore:	Channel:	Cove:	Totals:
Random Points:	24	14	16	14	68
Mainland Shell Middens:	1	0	1	8	10
Insular Shell Middens:	0	2	3	14	19
Non-shell Sites:	0	0	1	1	2
Totals:	25	16	21	37	99

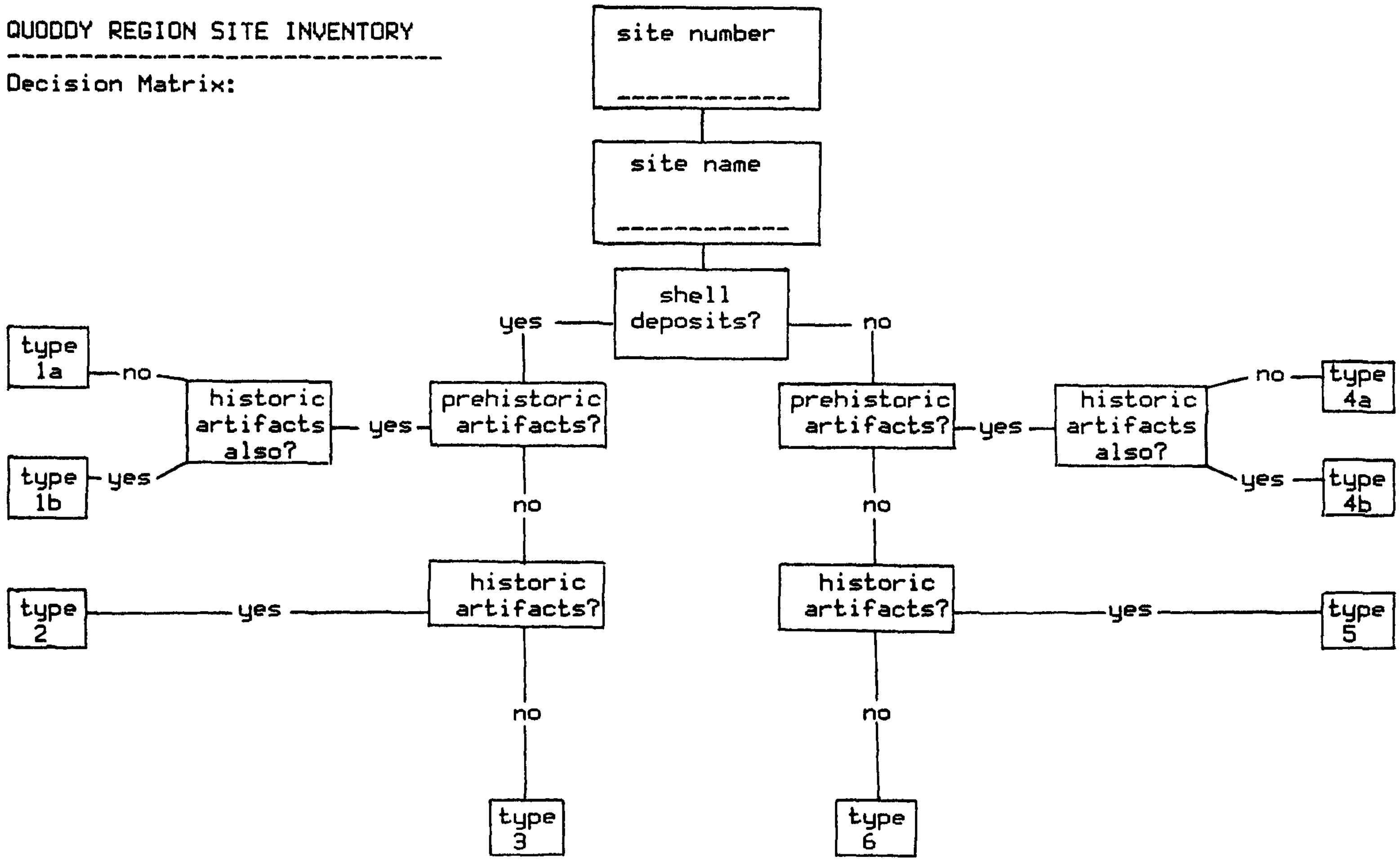
TABLE B-4: Sample sizes for locational analysis of Quoddy region archaeological sites.

	Random Points:	Prehistoric Shell Middens:	Prehistoric Non-shell Sites:
Subregions:			
PBM	27	10	1
WIN	27	11	0
BBS	14	6	1
BI	(21)	(4)	(1)
Totals:	68	27	2

FIGURE B-1: Decision matrix for sorting the Quoddy region site inventory into site types.

QUODDY REGION SITE INVENTORY

Decision Matrix:



Types:

1a -- prehistoric shell midden
1b -- multi-component shell midden
2 -- historic shell midden
3 -- unknown shell midden

4a -- prehistoric non-shell site
4b -- multi-component non-shell site
5 -- historic non-shell site
6 -- unknown non-shell site

FIGURE B-2: A polar co-ordinate graph showing annual wind speed and direction patterns for southern New Brunswick. The solid line shows wind direction by average wind speed; the broken line shows wind direction by percentage of occurrence. Data are from the St. John airport, and are averaged for the years 1953-1981.

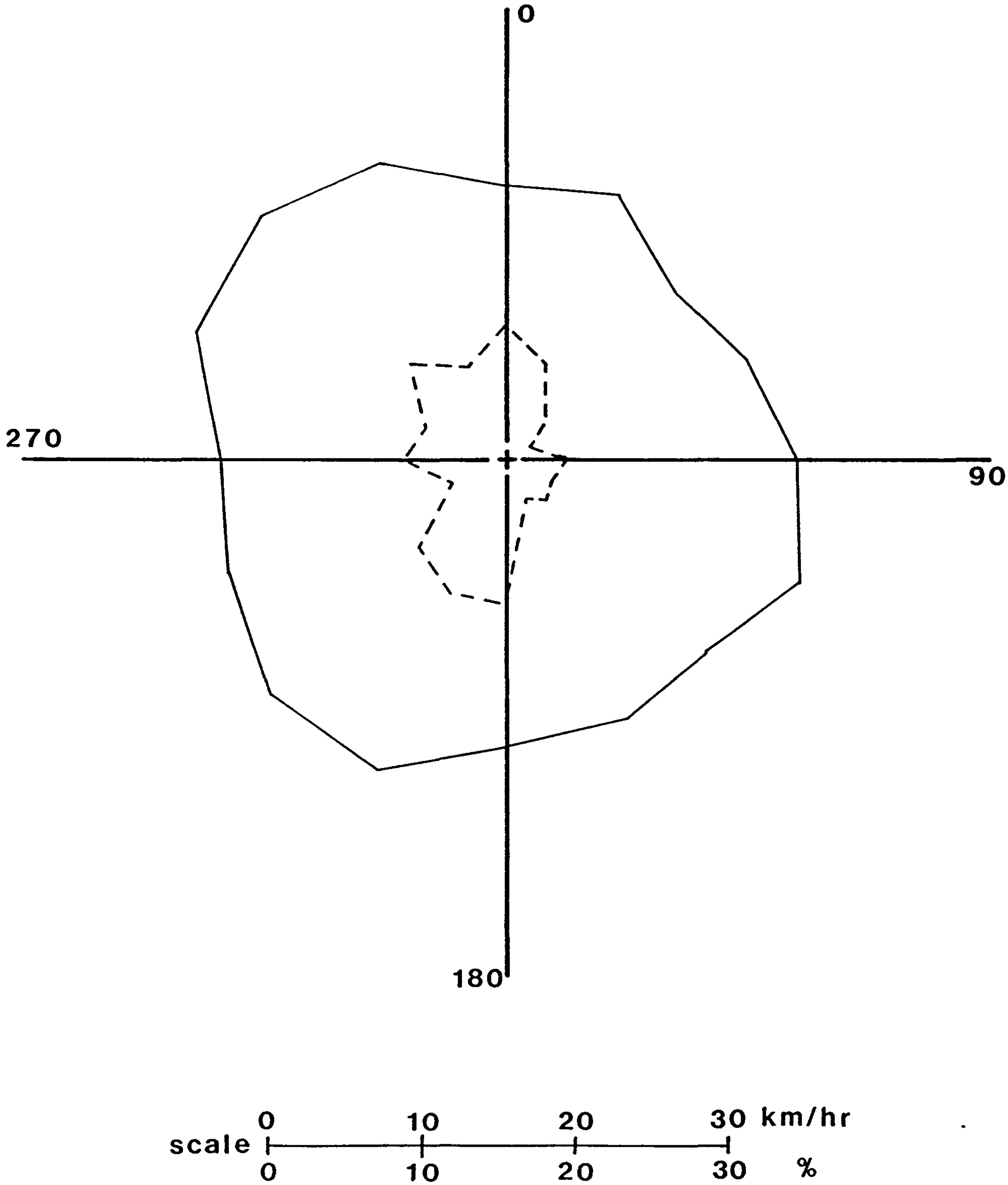
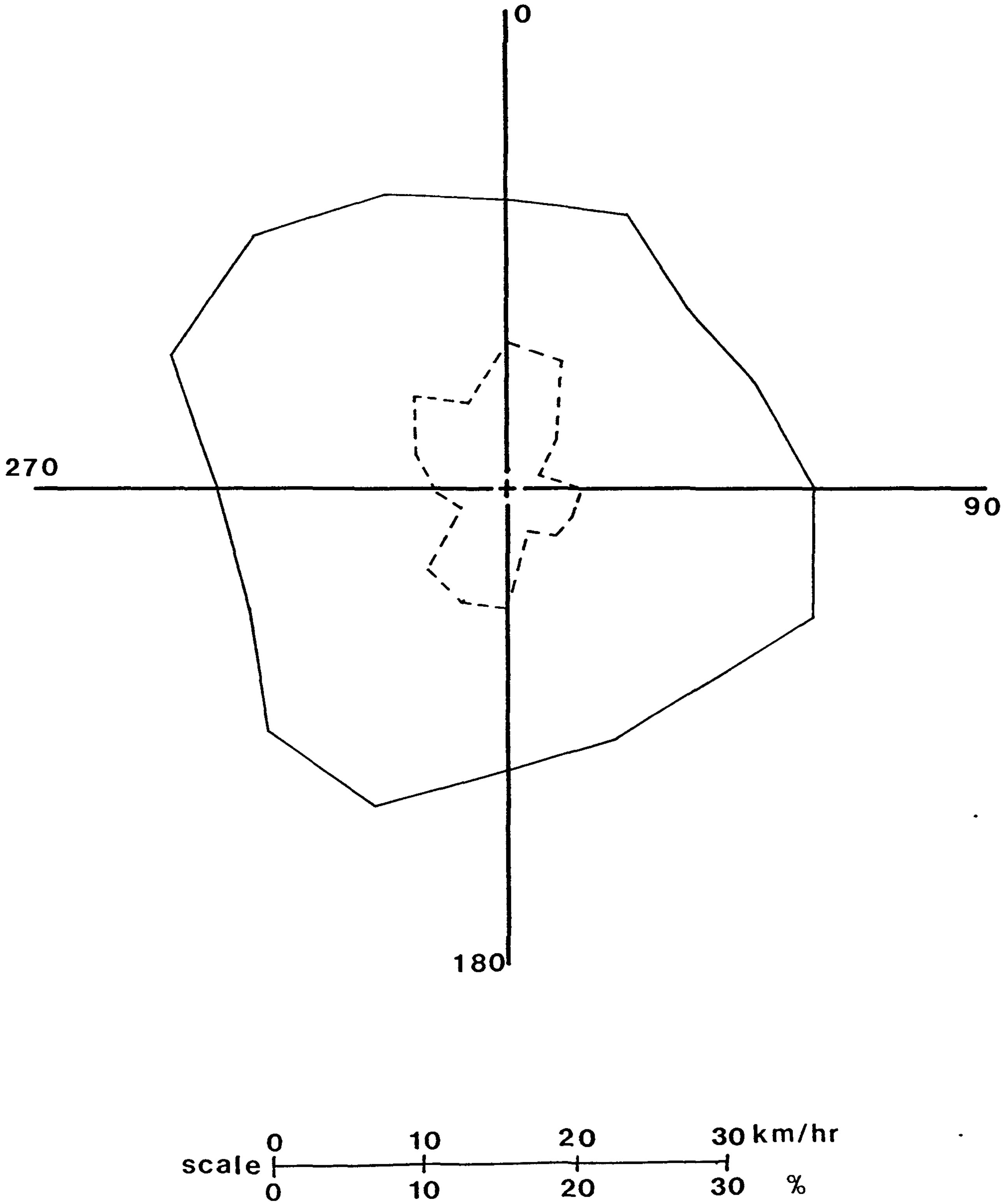
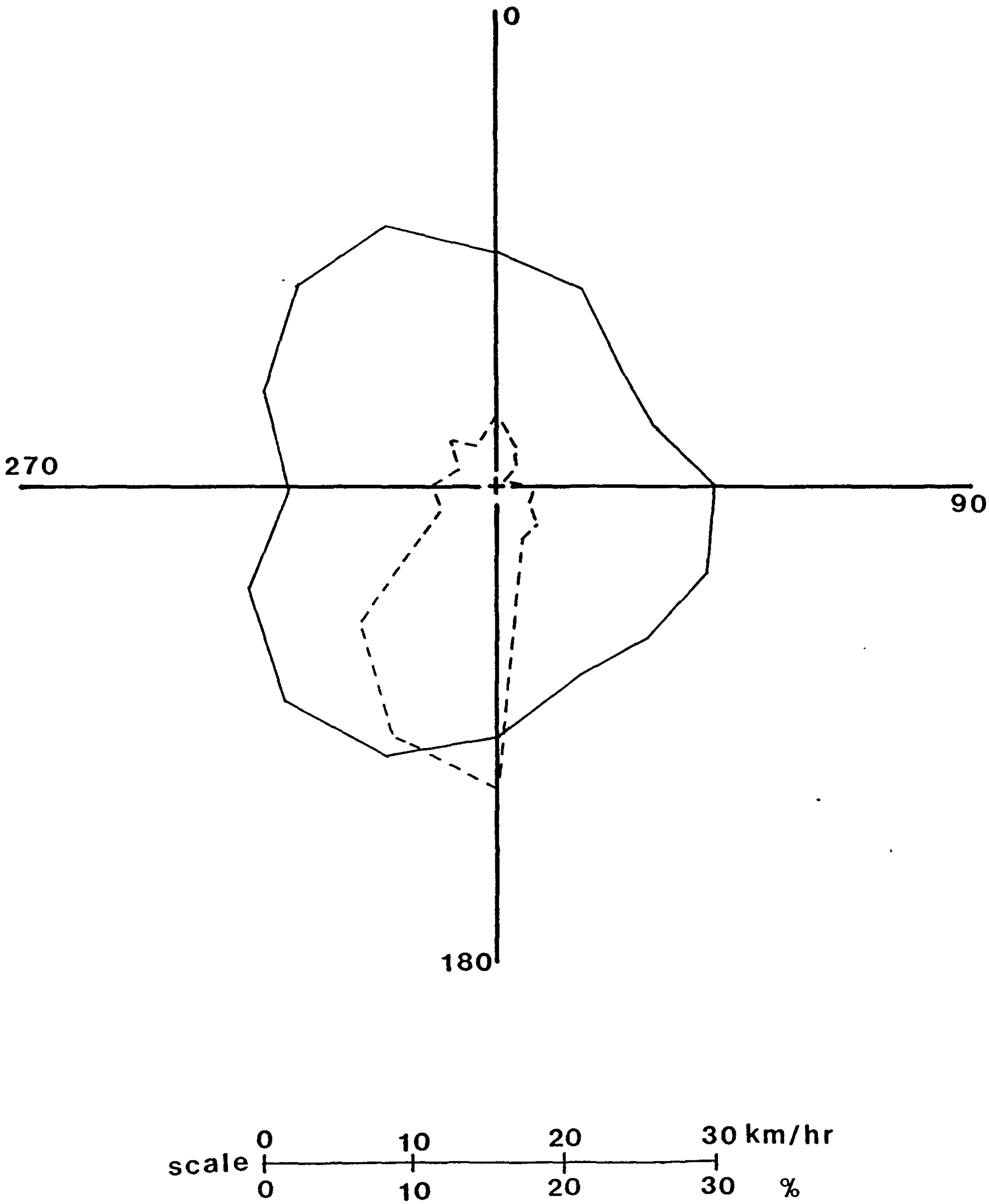

0
270
90
180
0 10 20 30 km/hr
scale
0 10 20 30 %

FIGURE B-3: A polar co-ordinate graph showing spring (April) wind speed and direction patterns for southern New Brunswick. The solid line shows wind direction by average wind speed; the broken line shows wind direction by percentage of occurrence. Data are from the St. John airport, and are averaged for the years 1953-1981.



0
270
90
180
0
10
20
30 km/hr
scale
0
10
20
30 %

FIGURE B-4: A polar co-ordinate graph showing summer (July) wind speed and direction patterns for southern New Brunswick. The solid line shows wind direction by average wind speed; the broken line shows wind direction by percentage of occurrence. Data are from the St. John airport, and are averaged for the years 1953-1981.



0
270
90
180
scale
0
10
20
30 km/hr
0
10
20
30
%

FIGURE B-5: A polar co-ordinate graph showing autumn (October) wind speed and direction patterns for southern New Brunswick. The solid line shows wind direction by average wind speed; the broken line shows wind direction by percentage of occurrence. Data are from the St. John airport, and are averaged for the years 1953-1981.

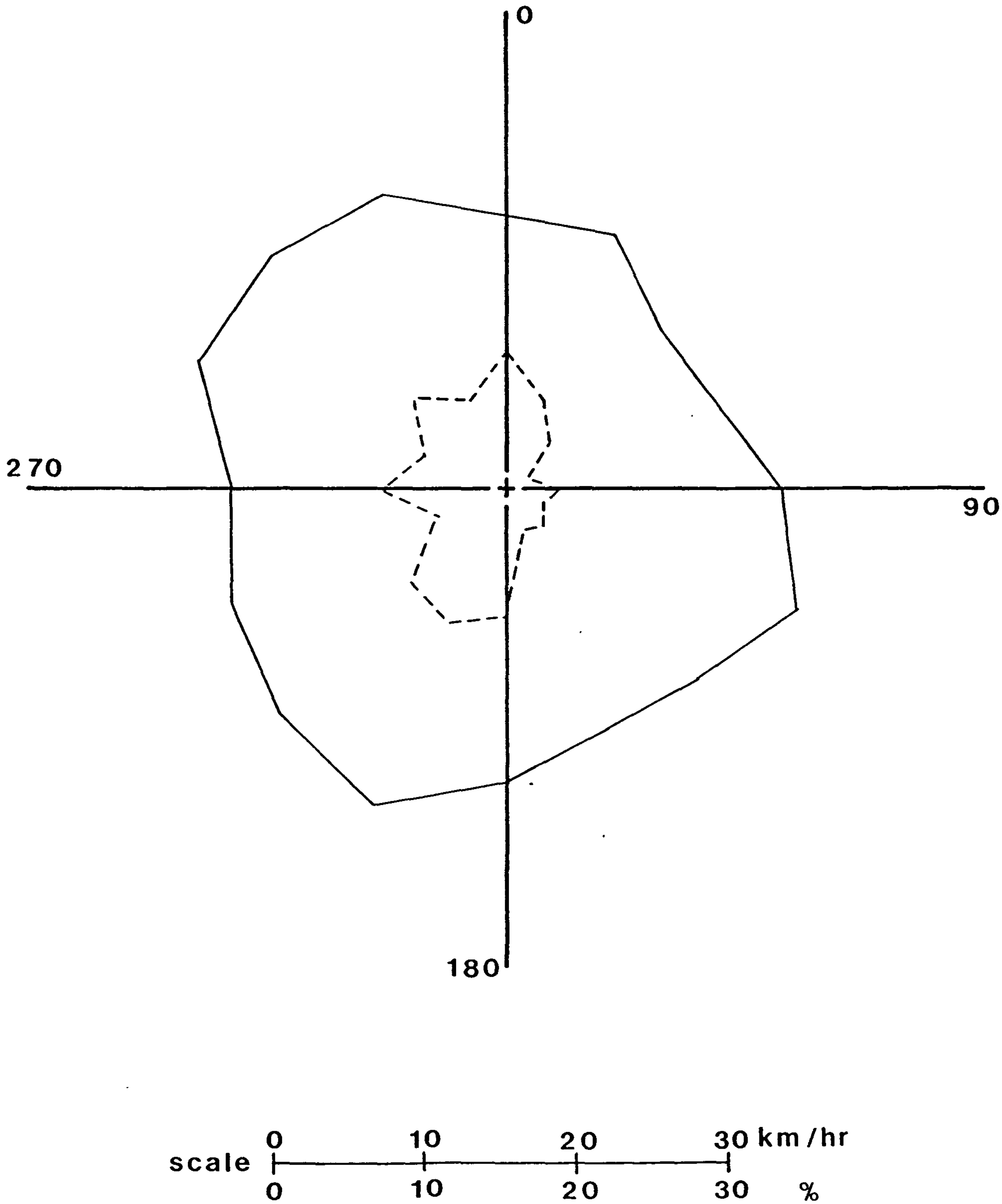

0
270
90
180
scale
0
10
20
30
km/hr
0
10
20
30
%

FIGURE B-6: A polar co-ordinate graph showing winter (January) wind speed and direction patterns for southern New Brunswick. The solid line shows wind direction by average wind speed; the broken line shows wind direction by percentage of occurrence. Data are from the St. John airport, and are averaged for the years 1953-1981.

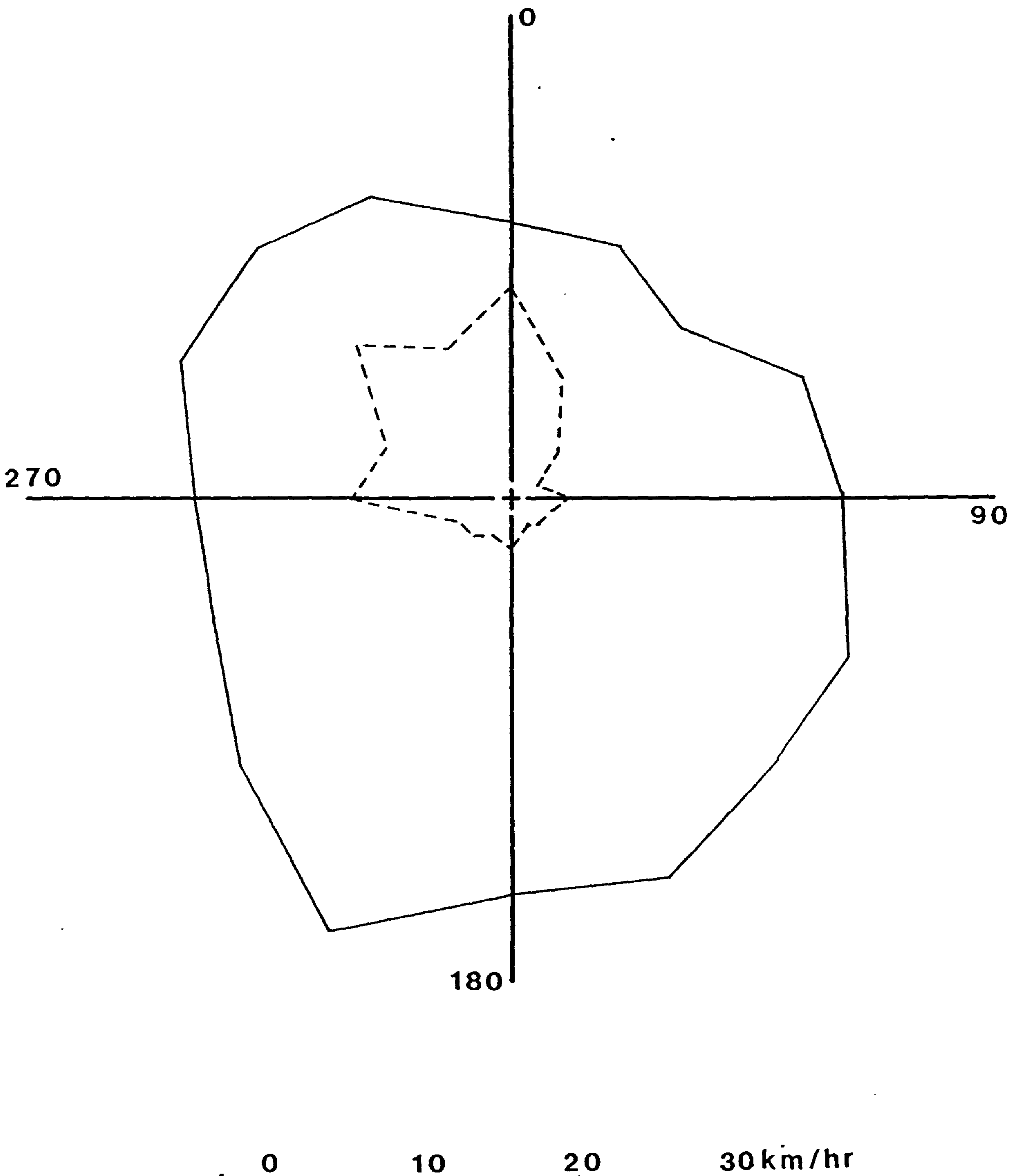
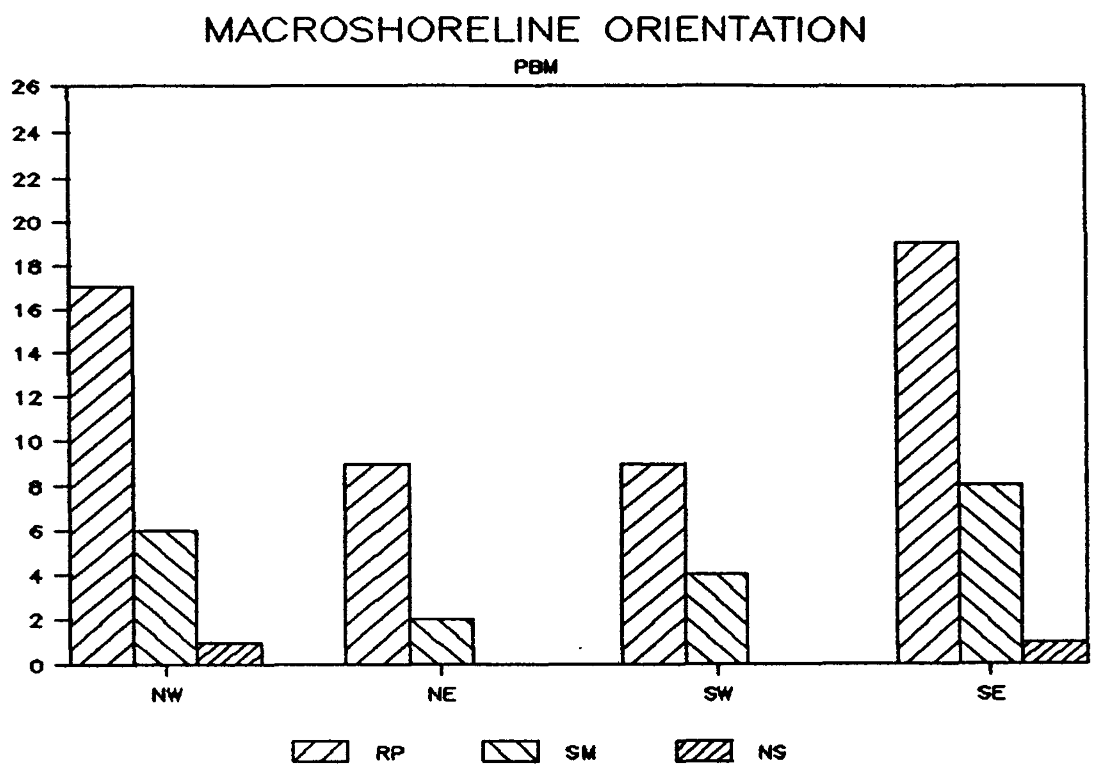
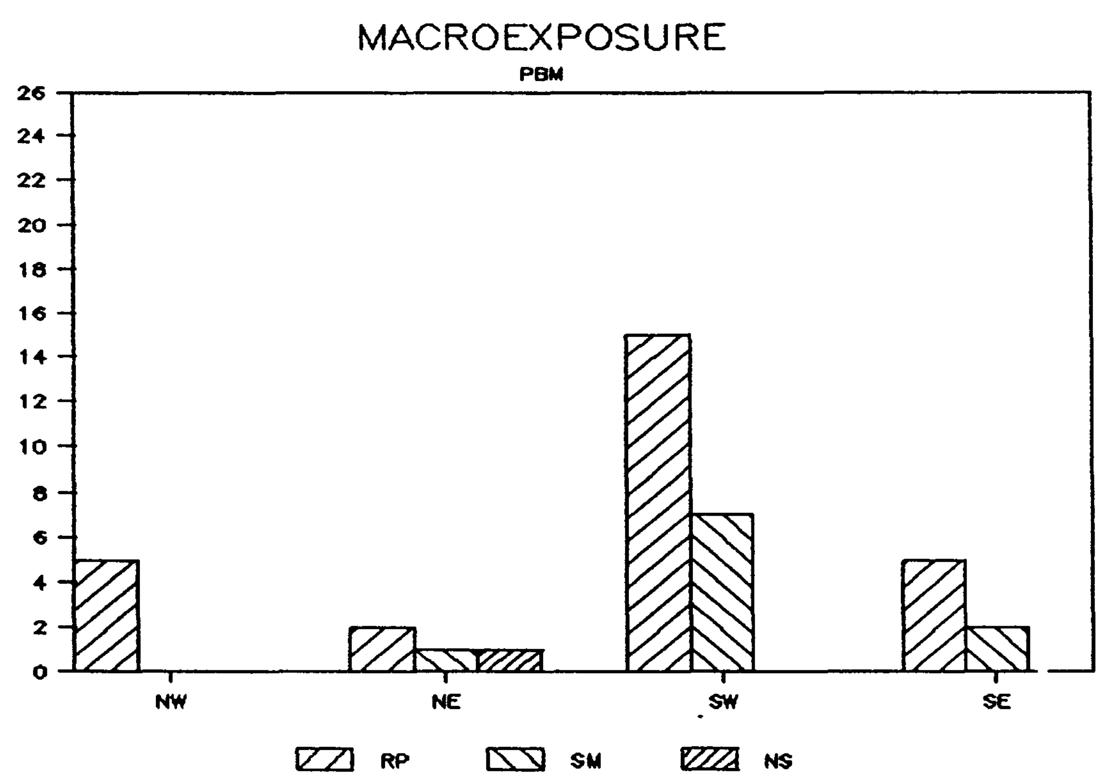
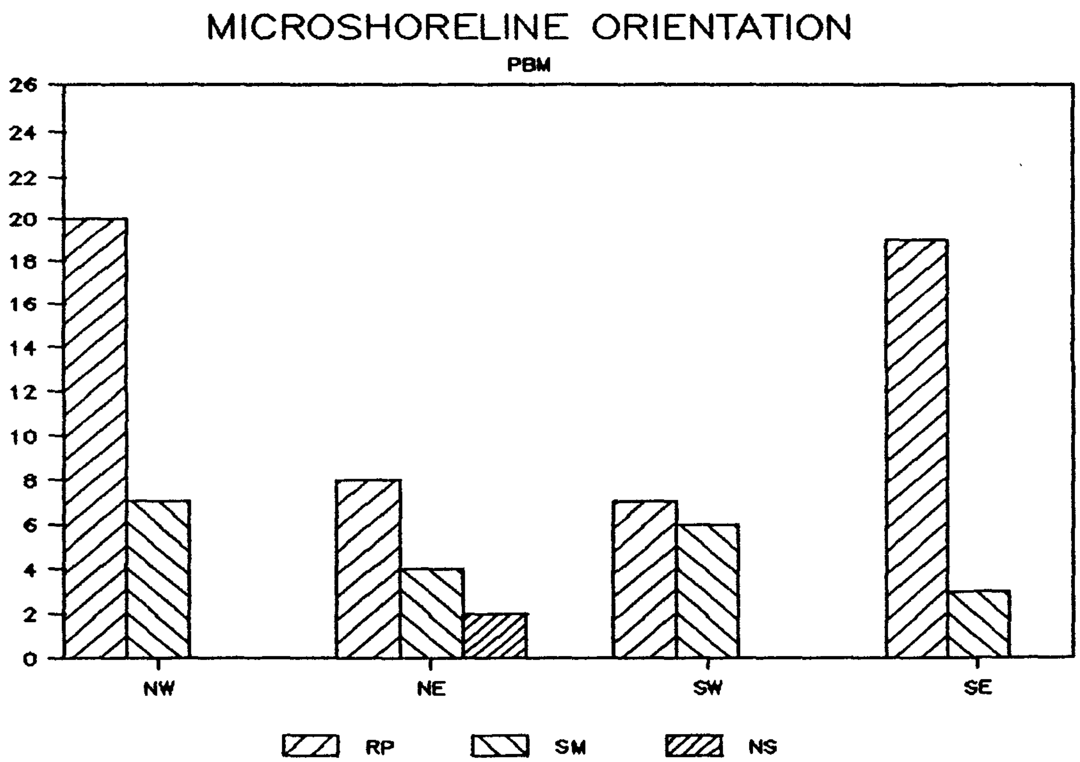
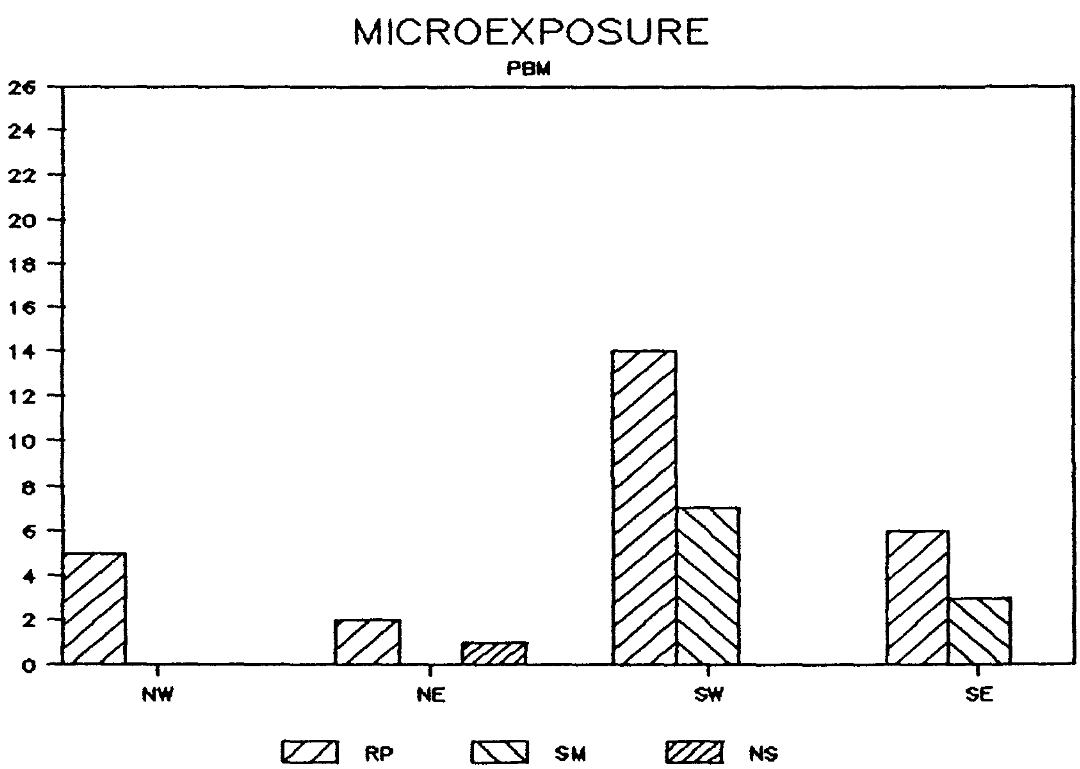

0
270
90
180
scale
0 10 20 30 km/hr
0 10 20 30 %

FIGURE B-7: Locational data for Passamaquoddy Bay Mainland (PBM) random points, shell middens, and non-shell sites.


MACROSHORELINE ORIENTATION
PBM
26
24
22
20
18
16
14
12
10
8
6
4
2
0
NW
NE
SW
SE
RP
SM
NS


MACROEXPOSURE
PBM
26
24
22
20
18
16
14
12
10
8
6
4
2
0
NW
NE
SW
SE
RP
SM
NS

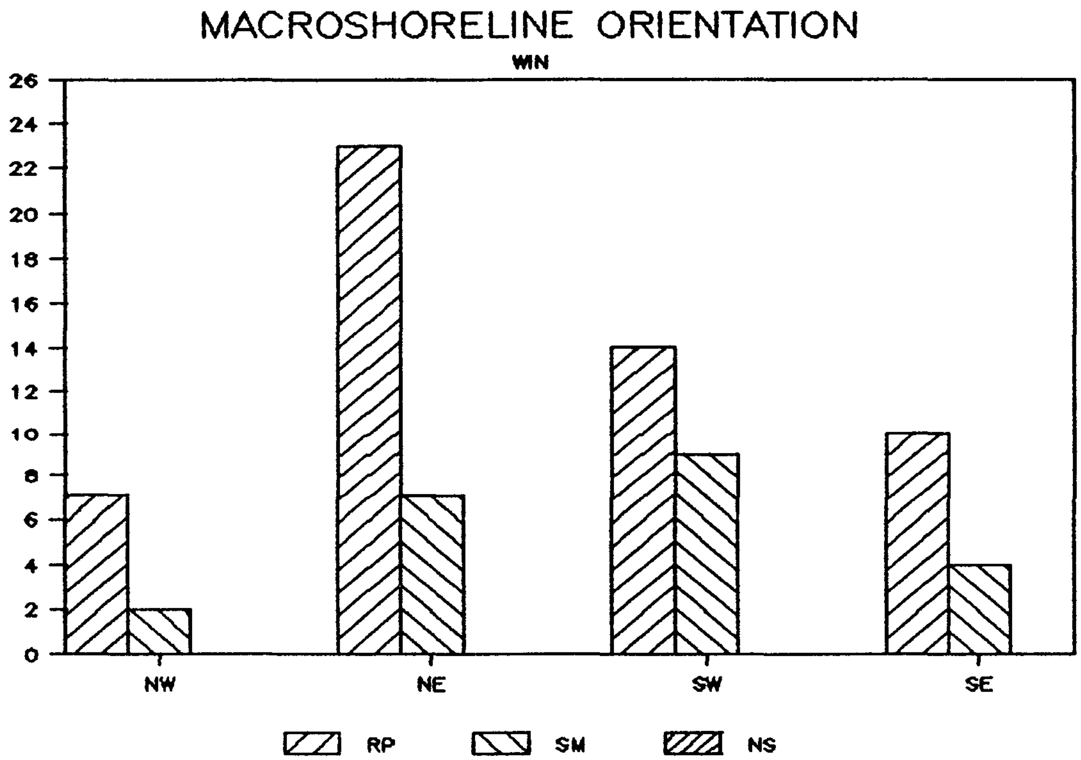


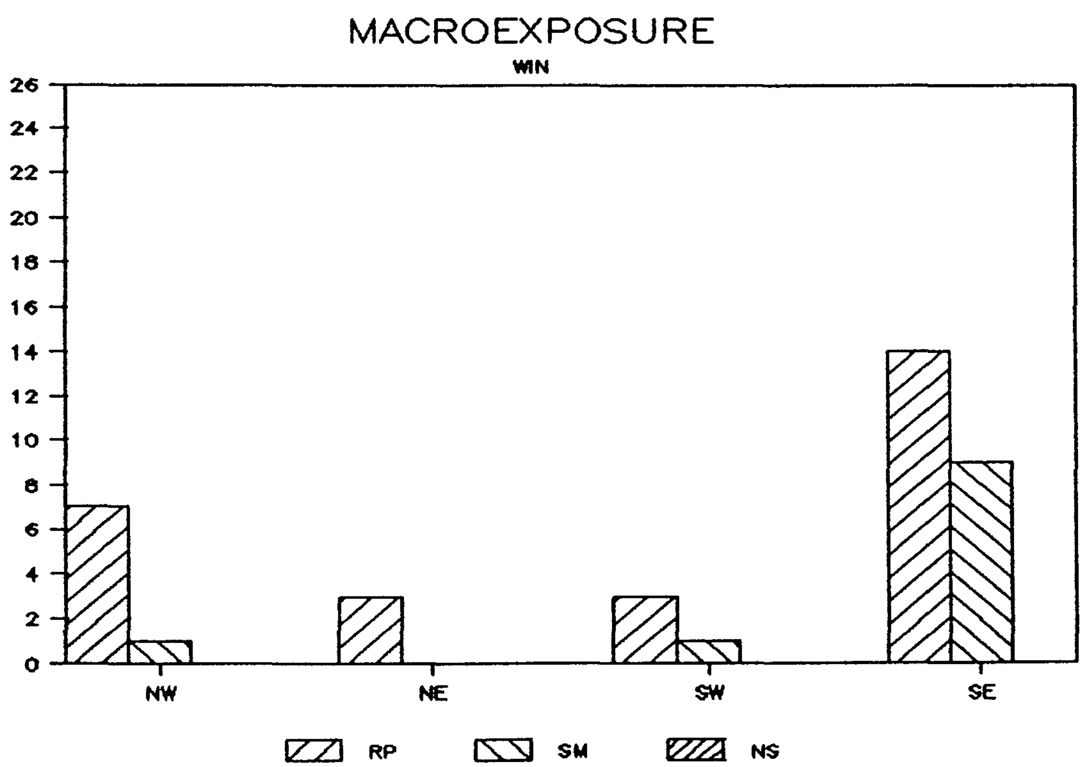


****

LIVING CLOSE TO THE LEDGE

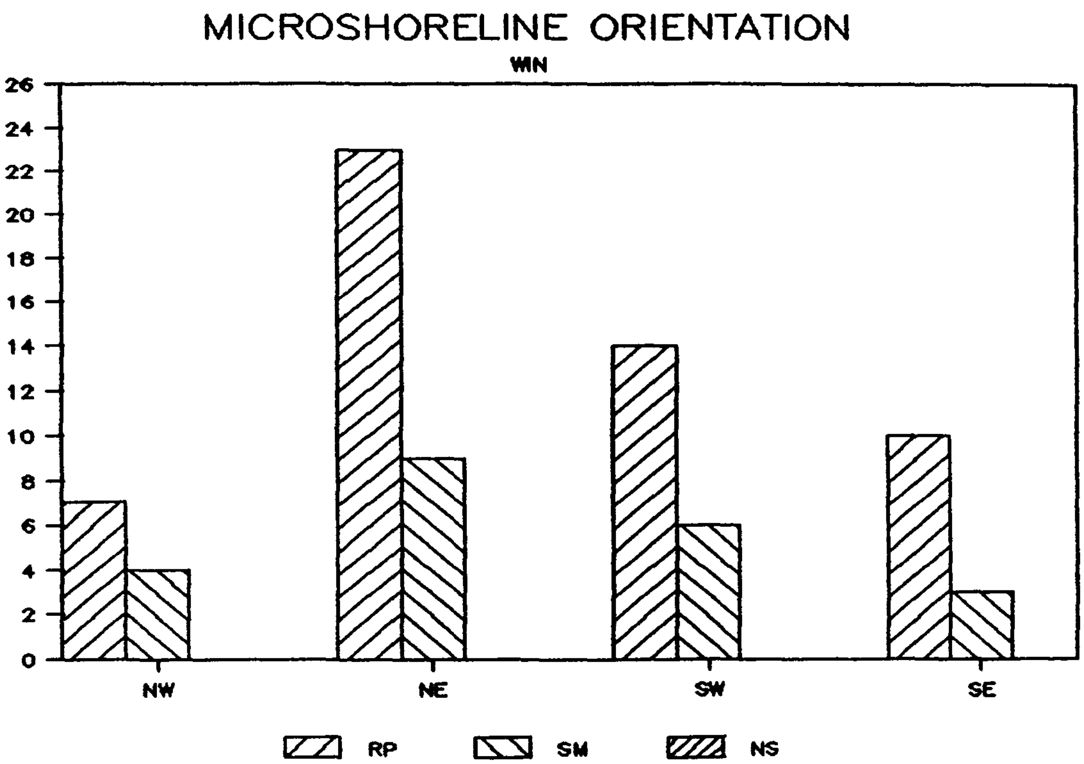
FIGURE B-8: Locational data for Northern West Isles (WIN) random points, shell middens, and non-shell sites.





****

LIVING CLOSE TO THE LEDGE


MICROSHORELINE ORIENTATION
WIN
26
24
22
20
18
16
14
12
10
8
6
4
2
0
NW
NE
SW
SE
RP
SM
NS

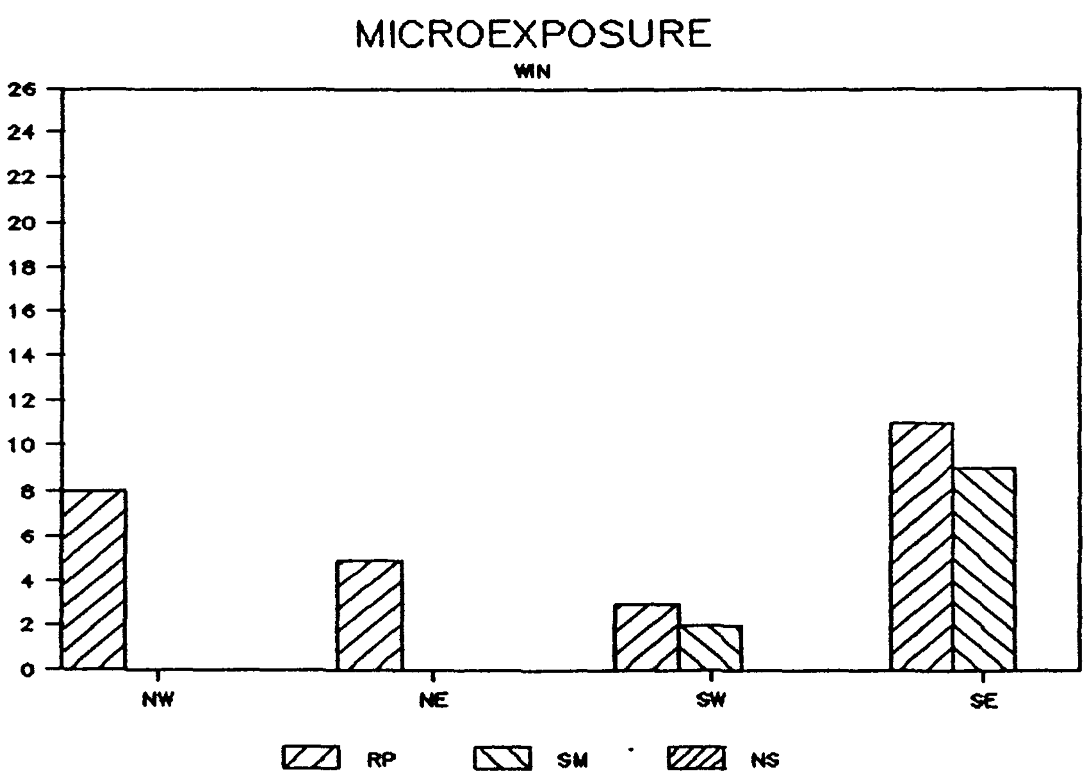
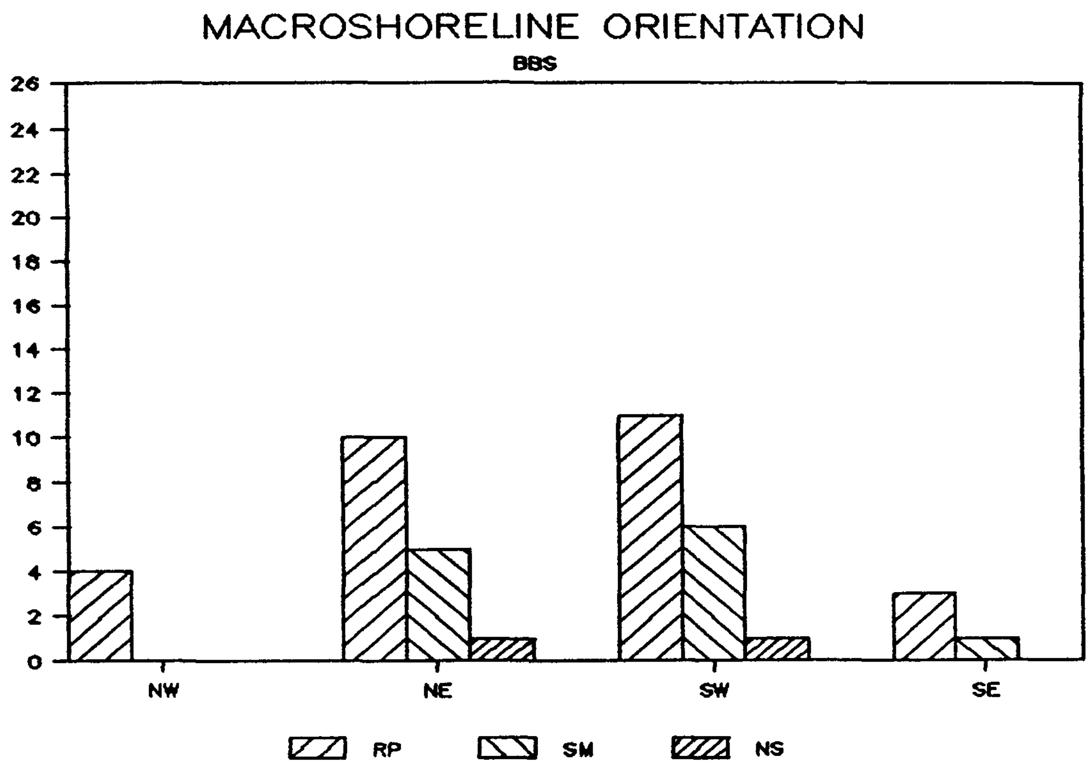
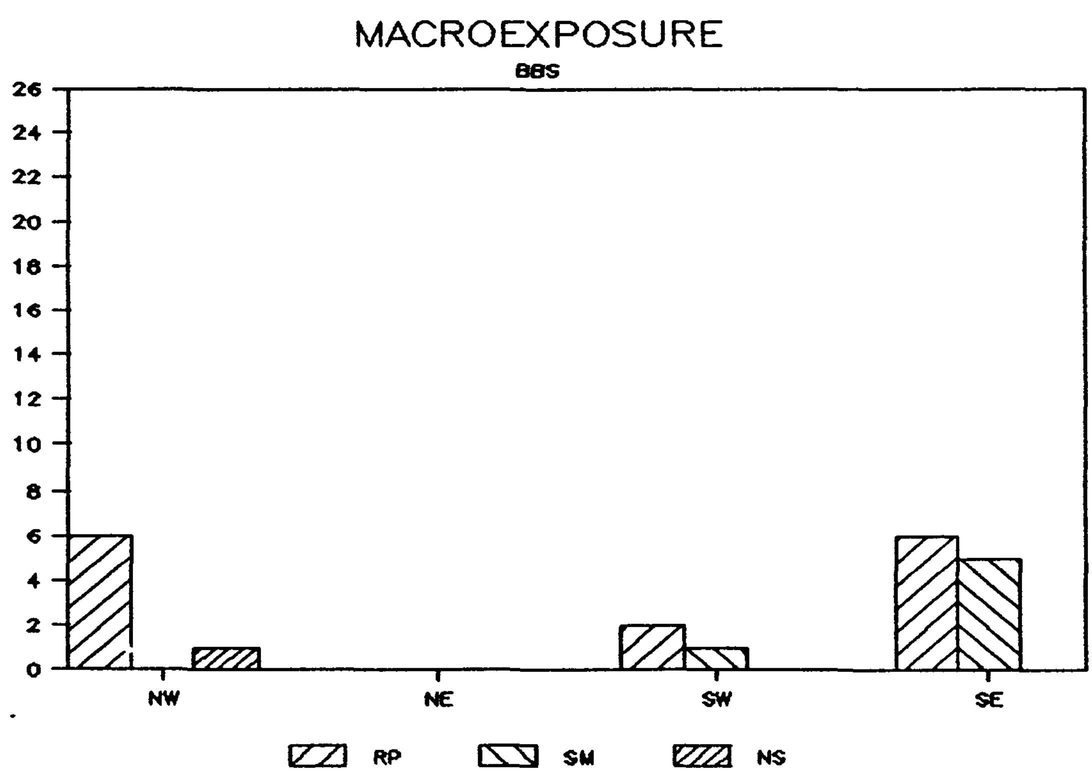
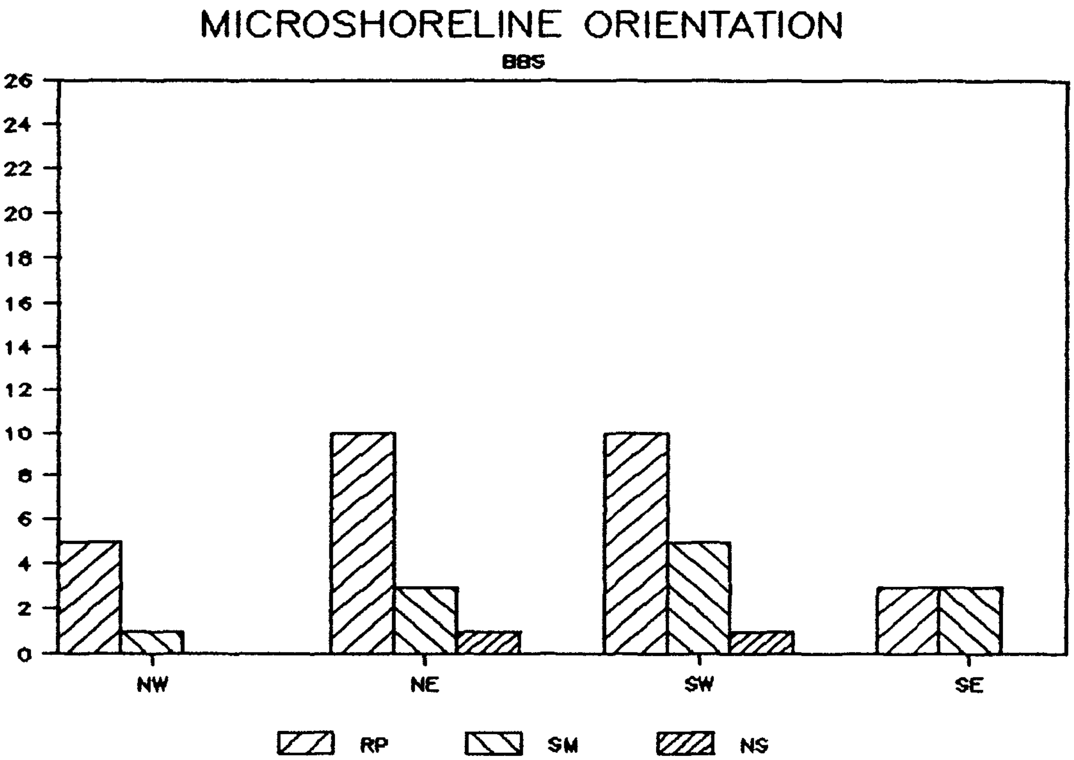

MICROEXPOSURE
WIN
26
24
22
20
18
16
14
12
10
8
6
4
2
0
NW
NE
SW
SE
RP
SM
NS

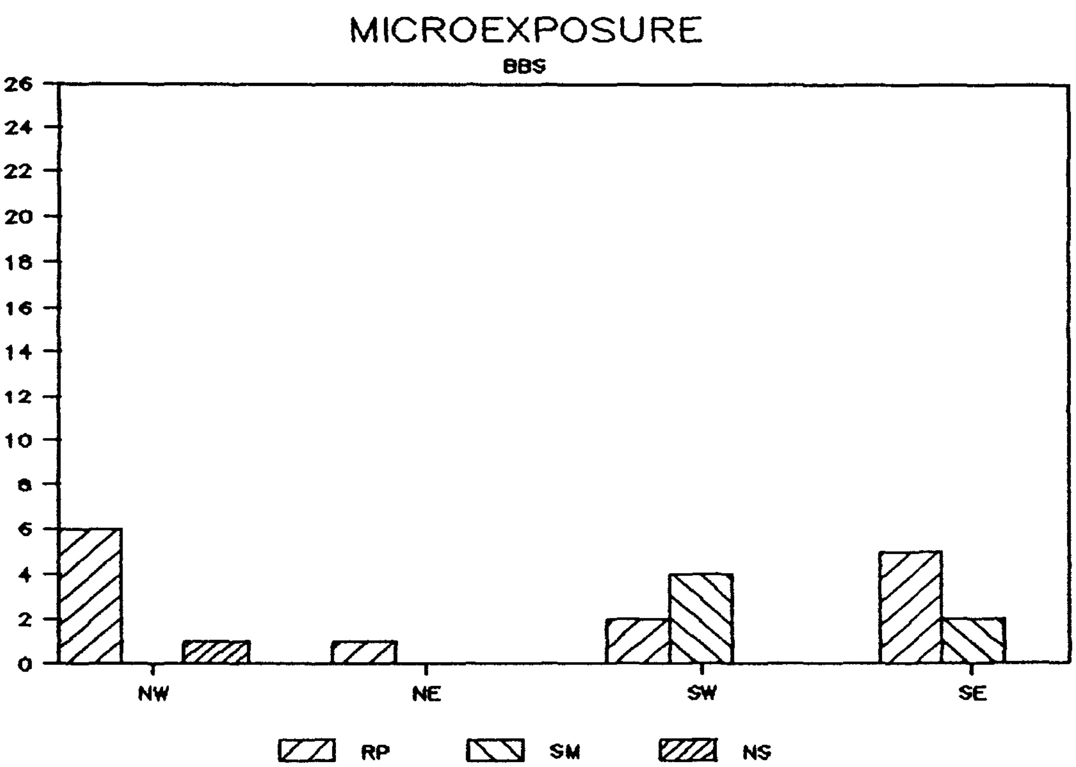
FIGURE B-9: Locational data for Back Bay Shelf (BBS) random points, shell middens, and non-shell sites.

****
LIVING CLOSE TO THE LEDGE


MACROSHORELINE ORIENTATION
BBS
26
24
22
20
18
16
14
12
10
8
6
4
2
0
NW
NE
SW
SE
RP
SM
NS

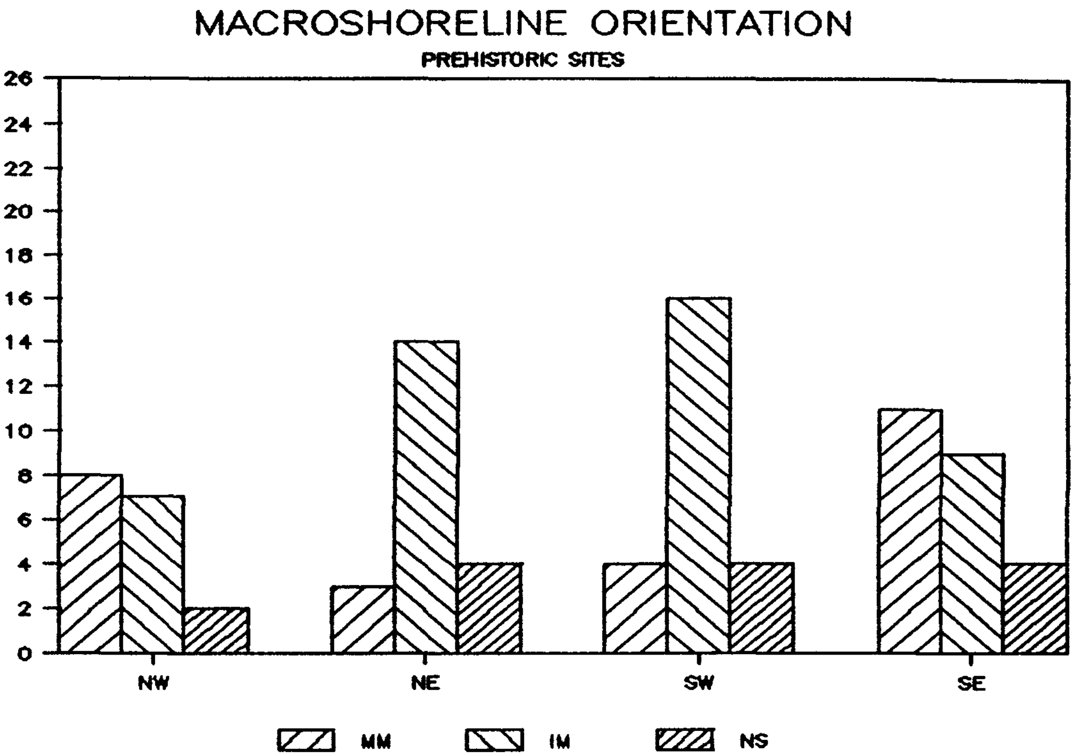

MACROEXPOSURE
BBS
26
24
22
20
18
16
14
12
10
8
6
4
2
0
NW
NE
SW
SE
RP
SM
NS

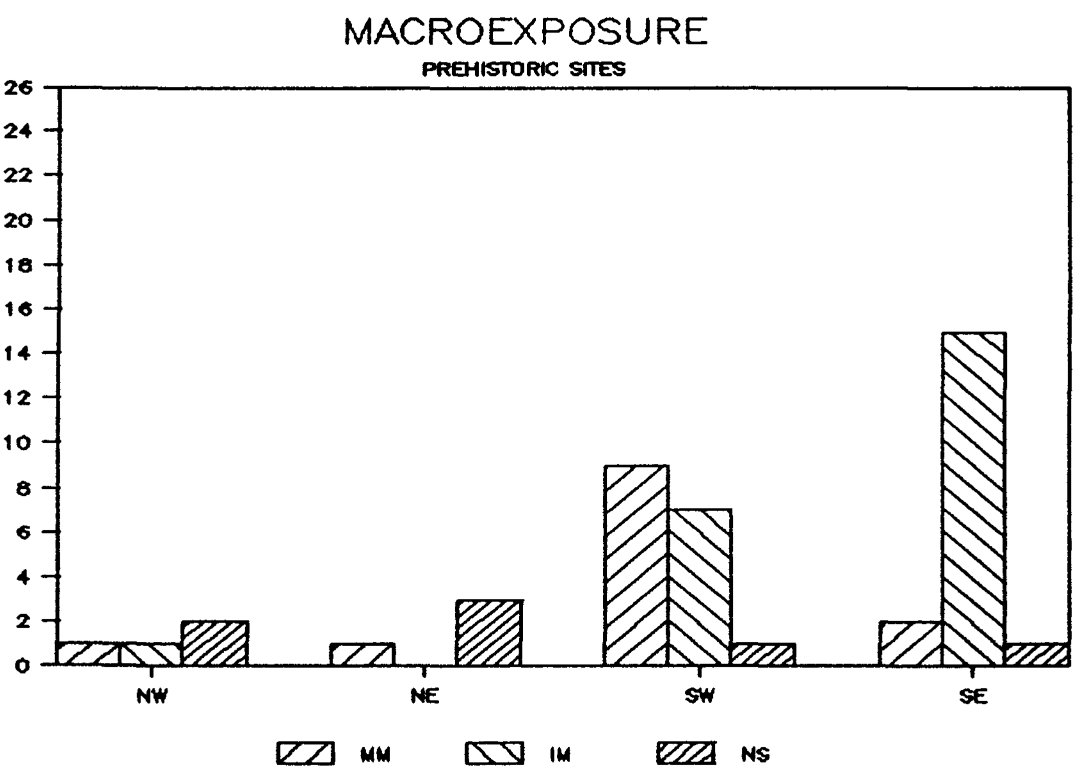




****
LIVING CLOSE TO THE LEDGE

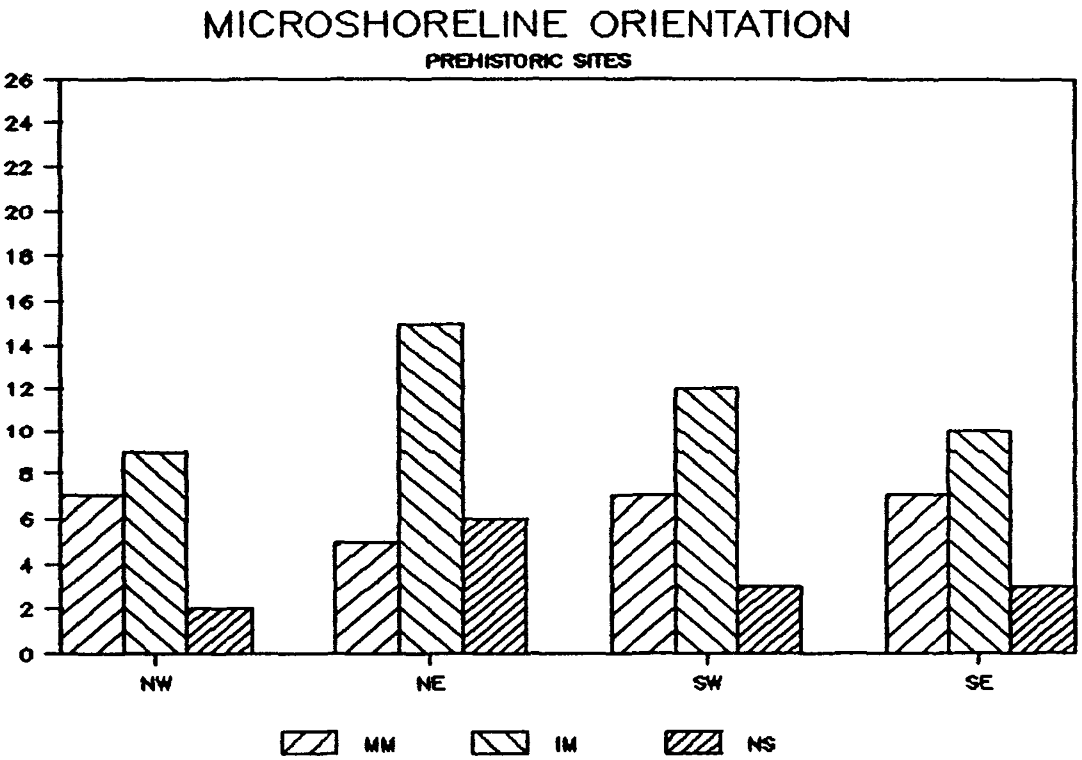
FIGURE B-10: Locational data for Quoddy region prehistoric archaeological sites: mainland shell middens, insular shell middens and non-shell sites.

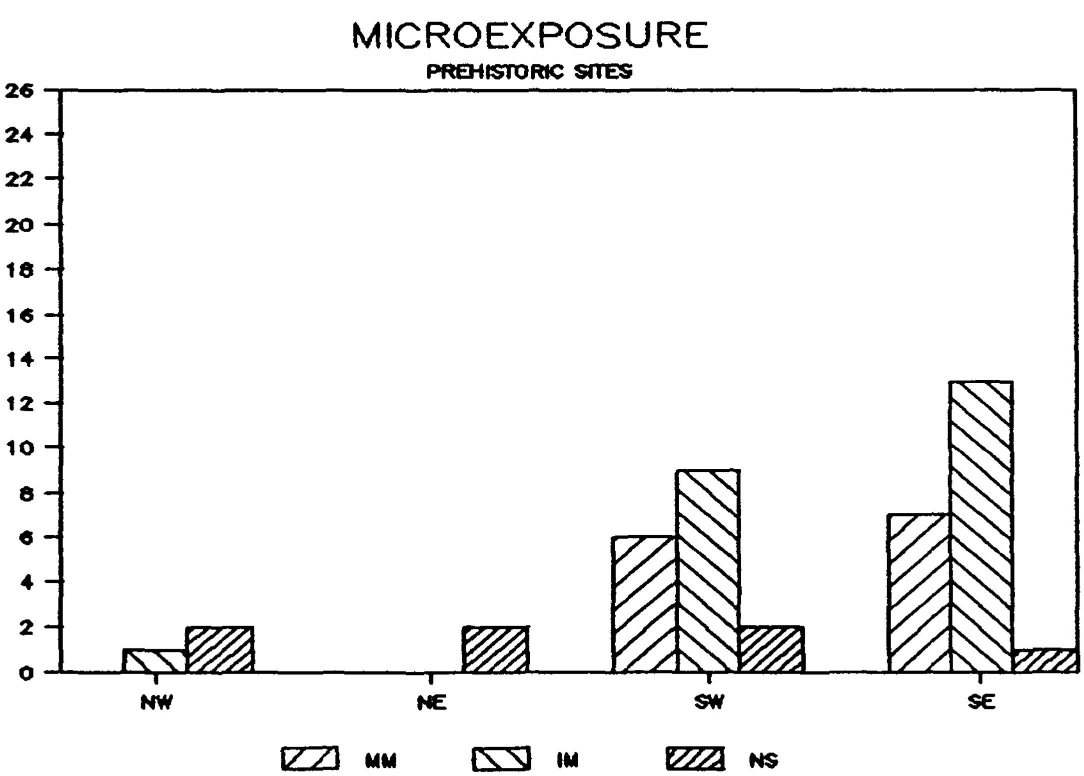




****

LIVING CLOSE TO THE LEDGE


MICROSHORELINE ORIENTATION
PREHISTORIC SITES
0
2
4
6
8
10
12
14
16
18
20
22
24
26
NW
NE
SW
SE
MM
IM
NS


MICROEXPOSURE
PREHISTORIC SITES
0
2
4
6
8
10
12
14
16
18
20
22
24
26
NW
NE
SW
SE
MM
IM
NS

Blank page inserted to maintain continuity.

APPENDIX C:

Supplementary Information for Chapter 5.

TABLE C-1: Bliss Islands lithic artifacts distribution--unifaces, cores and debitage.

Provenience: site:	unit:	Unifacial Flaked Stone: artifacts: scrapers	retouched flakes	utilized flakes	cores: bipolar cores	other cores	raw material	fla[illegible] lit[illegible] debit[illegible]
Camp:	area I	0	0	0	1	0	0	
	area II	4	0	0	1	0	0	[illegible]
	area III	7	0	0	8	1	0	
	area IV	5	7	4	1	0	0	1[illegible]
	unprov.	0	0	0	1	0	0	
	totals:	16	7	4	12	1	0	2[illegible]
	layer 4	2	0	0	4	0	0	
	layer 3	5	3	1	2	0	0	[illegible]
	layer 2	6	4	2	3	1	0	1[illegible]
	layer 1	3	0	1	1	0	0	[illegible]
	totals:	16	7	4	10	1	0	2[illegible]
Weir:	s.c. 4	7	1	2	5	3	1	[illegible]
	s.c. 3	0	2	2	0	1	0	
	s.c. 2	0	0	0	0	0	0	
	s.c. 1	1	0	0	0	0	0	
	unprov.	0	0	0	0	0	0	
	totals:	8	3	4	5	4	1	[illegible]
Northeast Point:	--	22	1	5	5	0	0	[illegible]
Ledge Site:	--	0	0	0	0	0	0	
Lighthouse Cove:	--	0	0	0	0	0	0	
Pintlowes Cove:	--	0	0	0	0	0	0	

TABLE C-2: Bliss Islands lithic artifacts distribution--bifaces, ground stone and other altered lithics.

		Bifacial Flaked Stone:			Groundstone Artifacts:			Other Altered Lithics:			
Provenience: site:	unit:	stemmed bifaces	unstemmed bifaces	biface tips	adze/axe blades	ground celts	ground fragments	hammer-stones	abrading stones	notched weights	other possible artifacts
Camp:	area I	0	2	2	0	0	0	1	0	0	0
	area II	3	2	0	1	0	0	0	1	0	3
	area III	1	5	3	0	0	0	0	1	0	0
	area IV	0	1	1	1	0	0	0	0	0	2
	unprov.	1	1	1	0	0	0	0	0	0	0
	totals:	5	11	7	2	0	0	1	2	0	5
	layer 4	0	2	1	1	0	0	0	0	0	1
	layer 3	1	3	2	0	0	0	0	1	0	2
	layer 2	2	3	1	1	0	0	1	0	0	2
	layer 1	1	1	1	0	0	0	0	1	0	0
	totals:	4	9	5	2	0	0	1	2	0	5
Weir:	s.c. 4	1	1	1	0	0	0	0	2	0	1
	s.c. 3	0	1	1	1	0	0	0	2	0	0
	s.c. 2	3	2	0	0	0	0	0	0	0	0
	s.c. 1	1	1	0	0	1	1	1	0	1	0
	unprov.	0	0	0	0	0	0	0	0	0	0
	totals:	5	5	2	1	1	1	1	4	1	1
Northeast Point:	--	2	3	2	0	0	0	0	0	0	0
Ledge Site:	--	0	0	0	0	0	0	0	0	0	0
Lighthouse Cove:	--	0	0	0	0	0	0	0	0	0	0
Pintlowes Cove:	--	0	0	0	0	0	0	0	0	0	0

TABLE C-3: Bliss Islands ceramic artifacts distribution--amounts, temper and decorative motifs.

Provenience: site:	unit:	Amount: weight (gm.)	Temper Types: shell (%)	grit (%)	Decorative Motifs: CWS	TRAIL	LDENT	RDENT	PPS	NLIP	PUNCT	PLAIN	INDST
Camp:	area I	56.5	0	100	-	-	+	-	-	+	-	-	+
	area II	148.3	0	100	-	-	+	+	+	-	-	-	+
	area III	90.5	0	100	-	+	-	+	-	+	+	-	-
	area IV	178.8	0	100	+	+	+	+	-	+	+	-	+
	unprov.	0.5	0	100	-	-	-	-	-	-	-	-	-
	totals:	474.6	0	100									
	layer 4	21.5	0	100	-	-	+	+	-	+	-	-	+
	layer 3	125.7	0	100	-	+	+	+	-	+	+	-	+
	layer 2	292.7	0	100	+	+	+	+	+	+	+	-	+
	layer 1	34.7	0	100	-	-	+	+	-	-	-	-	-
	totals:	474.6	0	100									
Weir:	s.c. 4	4.2	48	52	+	-	-	+	-	-	-	+	-
	s.c. 3	847.7	0	100	+	-	+	+	+	-	+	-	+
	s.c. 2	224.7	0	100	-	-	+	-	-	-	+	+	+
	s.c. 1	6.4	0	100	-	-	+	-	-	-	-	-	-
	unprov.	1.0	0	100	-	-	-	-	-	-	-	-	-
	totals:	1084.0	1	99									
Northeast Point:	--	0	0	0	-	-	-	-	-	-	-	-	-
Ledge Site:	--	0	0	0	-	-	-	-	-	-	-	-	-
Lighthouse Cove:	--	5.1	100	0	-	-	-	-	-	-	-	-	+
Pintlowes Cove:	--	0	0	0	-	-	-	-	-	-	-	-	-

Key to decorative motifs:

CWS--cord wrapped stick
TRAIL--linear trailed
LDENT--linear dentate stamp
RDENT--rocker dentate stamp
PPS--pseudo-scallop shell
NLIP--notched lip
PUNCT--punctations
PLAIN--undecorated
INDST--indistinct

TABLE C-4: Bliss Islands organic artifacts distributions.

Provenience: site:	unit:	modified rodent incisors	modified antler artifacts	other modified teeth	bone awls	bone needles	barbed bone artifacts	bone projectile points	pointed bone tips	bone working debitage	modified shell artifacts
Camp:	area I	1	0	0	1	1	0	0	0	2	0
	area II	1	0	0	0	0	0	0	3	0	0
	area III	1	0	0	0	1	0	0	0	1	0
	area IV	1	0	0	1	0	2	0	2	3	0
	unprov.	0	0	0	0	0	0	0	0	0	0
	totals:	4	0	0	2	2	2	0	5	6	0
	layer 4	0	0	0	0	0	0	0	0	0	0
	layer 3	3	0	0	2	0	1	0	3	4	0
	layer 2	0	0	0	0	2	1	0	2	2	0
	layer 1	1	0	0	0	0	0	0	0	0	0
	totals:	4	0	0	2	2	2	0	5	6	0
Weir:	s.c. 4	7	0	0	2	0	0	0	1	1	0
	s.c. 3	7	1	1	4	3	0	0	0	2	2
	s.c. 2	1	0	2	0	0	0	0	0	0	0
	s.c. 1	2	0	0	0	0	0	1	0	0	0
	unprov.	0	0	0	0	0	0	0	0	0	0
	totals:	17	1	3	6	3	0	1	1	3	2
Northeast Point:	--	1	0	0	0	0	0	0	0	0	0
Ledge Site:	--	0	0	0	0	0	0	0	0	0	0
Lighthouse Cove:	--	0	0	0	0	0	0	0	0	0	0
Pintlowes Cove:	--	1	0	0	0	0	0	0	0	0	0

TABLE C-5: Bliss Islands lithic material types.

Lithic Types:	Descriptions:
A	QUARTZ -color varies from milky white through greyish white to translucent -occasional yellow, orange and red tints -massive structure -weak conchoidal fracture -many internal flaws and irregularities -usually rounded pebble form -cortex weathered, dull reddish color LOCAL (Crotts 1984:38,41)
B	QUARTZITE -color varies medium to dark grey -occasional red and blue tints -occasional white quartz veinlets -massive structure -medium sugary texture, interlocking quartz grains -well developed conchoidal fracture -usually rounded pebble form -cortex weathered, dull reddish color LOCAL (Crotts 1984:42,44)
C	PORPHYRITIC TUFF/RHYOLITE -groundmass color black, green or brown -visible crystals of pink feldspar: 1-2mm in size -occasional crystals of white feldspar and quartz, and black magnetite -porphyritic/aphanic texture -well developed conchoidal fracture LOCAL (Crotts 1984:42,44)
D	BLACK SILTSTONE -color varies dark grey to black -occasional white quartz veinlets -very fine grained texture; no foliation -conchoidal fracture -cortical surfaces flat, weathered light grey LOCAL (Crotts 1984:44-46)

E BLACK VOLCANICS
-groundmass color black
-visible crystals of white feldspar: 0.4-2.0mm in size
-porphyritic/aphanic texture
-pronounced conchoidal fracture
-(similar to type C but without pink feldspar crystals)
LOCAL
(Crotts 1984:46)

F CRYPTOCRYSTALLINE QUARTZ

F-red -color varies pale to dark red
-occasional tan, black and white mottling
-occasional black banding
-translucent to opaque texture
-waxy to dull luster
-weak to pronounced conchoidal fracture
-frequent internal flaws and irregularities
-usually rounded pebble form
-cortex weathered dull red

F-brn -color varies white, tan, mustard yellow to light brown
-colors usually homogenous
-translucent texture, unless bleached to opaque
-waxy to dull luster
-moderate to pronounced conchoidal fracture

F-grn -color varies green to blue to grey
-occasional dark blue or black banding
-surfaces often bleached chalky white or grey
-opaque texture
-dull lustre
-moderate conchoidal fracture
-usually rounded pebble form
-cortex weathered dull green, or bleached dull white
EXOTIC
(Crotts 1984:48-52)

G RED or GREEN MUDSTONE

G-red -color deep red
-occasional black banding
-texture very fine grained, partially silicified
-weak to moderate conchoidal fracture
-slatey cleavage may be present
-usually rounded pebble form
-cortex weathered dull

G-grn -as above except color grey-green
-(this color group not identified in the Bliss Islands assemblages)
EXOTIC
(Crotts 1984:52,54)

H GREEN VOLCANICS
-groundmass color grey-green
-visible crystals white feldspar: to 1mm in size
-occasional very small quartz and mafic mineral crystals
-porphyritic/aphanic texture
-conchoidal fracture

EXOTIC
(Crotts 1984:54,56)

I FERRO-MANGANESE METASEDIMENTS
-color mottled black and red
-composed of patches of magnetite and hematite
-occasional crystals of white quartz and feldspar
-texture fine grained, silicious
-conchoidal fracture

EXOTIC
(Crotts 1984:56,57)

J WHITE-SPOTTED METASEDIMENT
-color light to medium green
-peppered with cream colored spots
-spots have indistinct edges
-texture aphanic, silicified
-conchoidal fracture

EXOTIC
(Crotts 1984:57,59)

K BANDED SLATE
-colors alternating blue and gray bands
-occasional thin veins of quartz crosscut banding
-texture very fine grained
-weak conchoidal fracture
-slaty cleavage present

(probably) LOCAL

L RED-BROWN VOLCANICS
-groundmass color varies mauve to brown
-visible crystals white feldspar, black mica: to 2mm size
-porphyritic/aphanic texture
-conchoidal fracture
-cortex flat, bleached light brown
-(similar to type C but without pink feldspar crystals)

(probably) LOCAL

M CRYSTALLINE PLUTONICS AND METAMORPHICS
-various types of crystalline plutonics and metamorphics included
-colors usually dark green or grey
-texture fine to coarse granular
-conchoidal fracture weak to absent
-usually rounded pebble form
-cortex weathered dull

(probably) LOCAL

ABLE C-6: Bliss Islands lithic materials distribution--piece counts (artifacts and debitage).

rovenience: site:	unit:	A	B	C	D	E	F-red	F-brn	F-grn	G	H	I	J	K	L	M
Camp:	area I	3	0	0	0	0	1	0	12	0	0	0	1	0	0	0
	area II	18	30	0	0	130	7	9	85	0	227	1	0	0	1	4
	area III	48	11	4	1	4	6	4	77	15	0	1	0	0	0	1
	area IV	1714	9	0	1	3	85	16	88	6	1	0	0	0	0	4
	unprov.	8	0	0	0	9	2	0	5	0	14	0	0	0	0	0
	totals:	1791	50	4	2	146	101	29	267	21	242	2	1	0	1	9
	layer 4	55	11	0	0	4	1	4	35	0	0	0	1	0	0	2
	layer 3	344	28	0	1	7	16	13	79	4	5	1	0	0	1	2
	layer 2	1366	10	4	1	27	43	9	130	7	71	1	0	0	0	4
	layer 1	18	1	0	0	99	39	3	18	10	152	0	0	0	0	1
	totals:	1783	50	4	2	137	99	29	262	21	228	2	1	0	1	9
Weir:	s.c. 4	76	57	0	4	102	25	42	34	2	75	1	0	0	1	4
	s.c. 3	4	0	0	0	3	0	0	3	0	11	0	0	0	2	5
	s.c. 2	0	1	1	0	3	6	0	0	0	0	0	0	0	0	0
	s.c. 1	1	0	0	0	1	0	0	4	0	3	0	0	1	0	2
	unprov.	7	2	0	0	0	1	1	5	0	22	0	0	0	0	0
	totals:	88	60	1	4	109	32	43	46	2	111	1	0	1	3	11
Northeast Point:	--	91	18	0	0	0	21	17	45	1	0	0	0	0	0	0
Ledge Site:	--	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lighthouse Cove:	--	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Pintlowes Cove:	--	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0

BLE C-7: Bliss Islands lithic materials distribution--weights of artifacts and debitage by material types (in gm).

ovenience: site:	unit:	A	B	C	D	E	F-red	F-brn	F-grn	G	H	I	J	K	L	M
Camp:	area I	60.9	0.0	0.0	0.0	0.0	2.9	0.0	73.6	0.0	0.0	0.0	12.2	0.0	0.0	0.0
	area II	212.9	296.0	0.0	0.0	320.7	24.1	65.9	227.3	0.0	726.0	9.2	0.0	0.0	4.6	531.3
	area III	164.7	14.7	41.9	1.4	14.5	15.5	22.6	174.2	27.6	0.0	1.2	0.0	0.0	0.0	87.4
	area IV	999.4	46.5	0.0	2.8	106.0	285.0	95.7	364.6	4.2	2.3	0.0	0.0	0.0	0.0	461.4
	unprov.	6.8	0.0	0.0	0.0	8.4	2.3	0.0	19.6	0.0	34.3	0.0	0.0	0.0	0.0	0.0
	totals:	1444.7	357.2	41.9	4.2	449.6	329.8	184.2	859.3	31.8	762.6	10.4	12.2	0.0	4.6	1080.1
	layer 4	44.2	57.6	0.0	0.0	7.3	2.1	60.4	190.1	0.0	0.0	0.0	12.2	0.0	0.0	244.7
	layer 3	691.5	277.3	0.0	2.8	118.6	83.7	70.8	281.1	13.1	13.7	9.2	0.0	0.0	4.6	250.4
	layer 2	693.4	13.9	41.9	1.4	31.7	189.4	40.6	308.9	11.5	224.2	1.2	0.0	0.0	0.0	530.0
	layer 1	12.8	8.4	0.0	0.0	283.6	52.5	12.5	59.6	7.2	490.4	0.0	0.0	0.0	0.0	55.0
	totals:	1441.9	357.2	41.9	4.2	441.2	327.7	184.3	839.7	31.8	728.3	10.4	12.2	0.0	4.6	1080.1
Weir:	s.c. 4	125.7	240.7	0.0	33.6	29.1	115.6	22.5	217.2	5.8	27.3	1.3	0.0	0.0	2.3	141.2
	s.c. 3	49.1	0.0	0.0	0.0	89.8	0.0	0.0	27.7	0.0	5.9	0.0	0.0	0.0	102.2	941.4
	s.c. 2	0.0	26.1	19.3	0.0	77.1	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	s.c. 1	1.1	0.0	0.0	0.0	58.0	0.0	0.0	27.3	0.0	905.3	0.0	0.0	8.2	0.0	158.8
	unprov.	21.4	10.5	0.0	0.0	0.0	2.3	0.4	73.9	0.0	22.4	0.0	0.0	0.0	0.0	0.0
	totals:	197.3	277.3	19.3	33.6	254.0	136.1	22.9	346.1	5.8	960.9	1.3	0.0	8.2	104.5	1241.4
Northeast Point:	--	251.7	61.8	0.0	0.0	0.0	82.0	73.7	193.8	7.3	0.0	0.0	0.0	0.0	0.0	0.0
Ledge Site:	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
.ighthouse Cove:	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pintlowes Cove:	--	0.0	3.2	0.0	0.0	0.0	0.0	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

LE C-8: Bliss Islands lithic materials distribution--proportions of assemblages by weight (artifacts and debitage).

venience: site:	unit:	A	B	C	D	E	F-red	F-brn	F-grn	G	H	I	J	K	L	M
Camp:	area I	0.0109	0.0000	0.0000	0.0000	0.0000	0.0005	0.0000	0.0132	0.0000	0.0000	0.0000	0.0022	0.0000	0.0000	0.0000
	area II	0.0382	0.0531	0.0000	0.0000	0.0575	0.0043	0.0118	0.0408	0.0000	0.1303	0.0017	0.0000	0.0000	0.0008	0.0953
	area III	0.0296	0.0026	0.0075	0.0003	0.0026	0.0028	0.0041	0.0313	0.0050	0.0000	0.0002	0.0000	0.0000	0.0000	0.0157
	area IV	0.1793	0.0083	0.0000	0.0005	0.0190	0.0511	0.0172	0.0654	0.0008	0.0004	0.0000	0.0000	0.0000	0.0000	0.0828
	unprov.	0.0012	0.0000	0.0000	0.0000	0.0015	0.0004	0.0000	0.0035	0.0000	0.0062	0.0000	0.0000	0.0000	0.0000	0.0000
	totals:	0.2592	0.0640	0.0075	0.0008	0.0806	0.0591	0.0331	0.1542	0.0058	0.1369	0.0019	0.0022	0.0000	0.0008	0.1938
	layer 4	0.0080	0.0105	0.0000	0.0000	0.0013	0.0004	0.0110	0.0345	0.0000	0.0000	0.0000	0.0022	0.0000	0.0000	0.0445
	layer 3	0.1257	0.0504	0.0000	0.0005	0.0216	0.0152	0.0129	0.0511	0.0024	0.0025	0.0017	0.0000	0.0000	0.0008	0.0455
	layer 2	0.1260	0.0025	0.0076	0.0003	0.0058	0.0344	0.0074	0.0561	0.0021	0.0407	0.0002	0.0000	0.0000	0.0000	0.0963
	layer 1	0.0023	0.0015	0.0000	0.0000	0.0515	0.0095	0.0023	0.0108	0.0013	0.0891	0.0000	0.0000	0.0000	0.0000	0.0100
	totals:	0.2620	0.0649	0.0076	0.0008	0.0802	0.0595	0.0336	0.1525	0.0058	0.1323	0.0019	0.0022	0.0000	0.0008	0.1963
Weir:	s.c. 4	0.0348	0.0667	0.0000	0.0093	0.0081	0.0320	0.0062	0.0602	0.0016	0.0076	0.0004	0.0000	0.0000	0.0006	0.0391
	s.c. 3	0.0136	0.0000	0.0000	0.0000	0.0249	0.0000	0.0000	0.0077	0.0000	0.0016	0.0000	0.0000	0.0000	0.0283	0.2609
	s.c. 2	0.0000	0.0072	0.0053	0.0000	0.0214	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	s.c. 1	0.0003	0.0000	0.0000	0.0000	0.0161	0.0000	0.0000	0.0076	0.0000	0.2509	0.0000	0.0000	0.0023	0.0000	0.0440
	unprov.	0.0059	0.0029	0.0000	0.0000	0.0000	0.0006	0.0000	0.0205	0.0000	0.0062	0.0000	0.0000	0.0000	0.0000	0.0000
	totals:	0.0546	0.0768	0.0053	0.0093	0.0705	0.0376	0.0062	0.0960	0.0016	0.2663	0.0004	0.0000	0.0023	0.0289	0.3440
Northeast Point:	--	0.3755	0.0922	0.0000	0.0000	0.1223	0.1100	0.2891	0.0109	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ledge Site:	--	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ighthouse Cove:	--	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pintlowes Cove:	--	0.0000	0.3678	0.0000	0.0000	0.0000	0.0000	0.0000	0.6322	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ILE C-9: Bliss Islands lithic materials distribution--average piece sizes of artifacts and debitage (gm.).

ovenience: site:	unit:	A	B	C	D	E	F-red	F-brn	F-grn	G	H	I	J	K	L	M
Camp:	area I	20.3	0.0	0.0	0.0	0.0	2.9	0.0	6.1	0.0	0.0	0.0	12.2	0.0	0.0	0.0
	area II	11.8	9.9	0.0	0.0	2.5	3.4	7.3	2.7	0.0	3.2	9.2	0.0	0.0	4.6	132.8
	area III	3.4	1.3	10.5	1.4	3.6	2.6	5.7	2.3	1.8	0.0	1.2	0.0	0.0	0.0	87.4
	area IV	0.6	5.2	0.0	2.8	35.3	3.4	6.0	4.1	0.7	2.3	0.0	0.0	0.0	0.0	115.4
	unprov.	0.9	0.0	0.0	0.0	0.9	1.2	0.0	3.9	0.0	2.5	0.0	0.0	0.0	0.0	0.0
	totals:	0.8	7.1	10.5	2.1	3.1	3.3	6.4	3.2	1.5	3.2	5.2	12.2	0.0	4.6	120.0
	layer 4	0.8	5.2	0.0	0.0	1.8	2.1	15.1	5.4	0.0	0.0	0.0	12.2	0.0	0.0	122.4
	layer 3	2.0	9.9	0.0	2.8	16.9	5.2	5.4	3.6	3.3	2.7	9.2	0.0	0.0	4.6	125.2
	layer 2	0.5	1.4	10.5	1.4	1.2	4.4	4.5	2.4	1.6	3.2	1.2	0.0	0.0	0.0	132.5
	layer 1	0.7	8.4	0.0	0.0	2.9	1.3	4.2	3.3	0.7	3.2	0.0	0.0	0.0	0.0	55.0
	totals:	0.8	7.1	10.5	2.1	3.2	3.2	6.4	3.2	1.5	3.2	5.2	12.2	0.0	4.6	120.0
Weir:	s.c. 4	1.7	4.2	0.0	8.4	0.3	4.6	0.5	6.4	2.9	0.4	1.3	0.0	0.0	2.3	35.3
	s.c. 3	12.3	0.0	0.0	0.0	29.9	0.0	0.0	9.2	0.0	5.0	0.0	0.0	0.0	51.1	188.3
	s.c. 2	0.0	26.1	19.3	0.0	25.7	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	s.c. 1	1.1	0.0	0.0	0.0	58.0	0.0	0.0	6.8	0.0	301.8	0.0	0.0	8.2	0.0	79.4
	unprov.	3.1	5.3	0.0	0.0	0.0	2.3	0.4	14.8	0.0	1.0	0.0	0.0	0.0	0.0	0.0
	totals:	2.2	4.6	19.3	8.4	2.3	4.3	0.5	7.5	2.9	8.7	1.3	0.0	8.2	34.8	112.9
Northeast Point:	--	2.8	3.4	0.0	0.0	0.0	3.9	4.3	4.3	7.3	0.0	0.0	0.0	0.0	0.0	0.0
Ledge Site:	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ighthouse Cove:	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pintlowes Cove:	--	0.0	3.2	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

LE C-10: Bliss Islands lithic materials distribution--amounts of artifacts and debitage per unit volume (gm/cu.m).

venience: site:	unit:	A	B	C	D	E	F-red	F-brn	F-grn	G	H	I	J	K	L	M
Camp:	area I	27.9	0.0	0.0	0.0	0.0	1.3	0.0	33.8	0.0	0.0	0.0	5.6	0.0	0.0	0.0
	area II	81.3	113.0	0.0	0.0	122.4	9.2	25.2	86.8	0.0	277.1	3.5	0.0	0.0	1.8	202.8
	area III	88.1	7.9	22.4	0.8	7.8	8.3	12.1	93.2	14.8	0.0	0.0	0.0	0.0	0.0	46.7
	area IV	323.4	15.0	0.0	0.9	34.3	92.2	31.0	118.0	1.4	0.0	0.0	0.0	0.0	0.0	149.3
	totals:	14.8	36.6	4.3	0.4	46.1	33.8	18.9	88.0	3.3	78.1	1.1	1.3	0.0	0.5	110.7
	layer 4	14.4	18.8	0.0	0.0	2.4	0.0	19.7	61.9	0.0	0.0	0.0	4.0	0.0	0.0	81.6
	layer 3	181.0	72.6	0.0	0.7	31.0	21.9	18.5	73.6	3.4	3.6	2.4	0.0	0.0	1.2	65.6
	layer 2	280.7	5.6	17.0	0.6	12.8	76.7	16.4	125.1	4.7	90.8	0.0	0.0	0.0	0.0	214.6
	layer 1	32.0	21.0	0.0	0.0	709.0	131.3	31.3	149.0	18.0	1226.0	0.0	0.0	0.0	0.0	137.5
	totals:	147.7	36.6	4.3	0.4	45.2	33.6	18.9	86.0	3.3	74.6	1.1	1.3	0.0	0.5	110.7
Weir:	s.c. 4	44.1	84.5	0.0	11.8	10.2	40.6	7.9	76.2	2.0	9.6	0.5	0.0	0.0	0.0	49.5
	s.c. 3	8.0	0.0	0.0	0.0	14.7	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	16.8	154.3
	s.c. 2	0.0	8.9	6.6	0.0	26.3	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	s.c. 1	1.5	0.0	0.0	0.0	77.3	0.0	0.0	36.4	0.0	1207.1	0.0	0.0	10.9	0.0	211.7
	totals:	15.6	22.0	1.5	2.7	20.1	10.8	1.8	27.4	0.5	76.1	0.1	0.0	0.7	8.3	98.3
Northeast Point:	--	839.0	206.0	0.0	0.0	0.0	273.3	244.3	646.0	24.3	0.0	0.0	0.0	0.0	0.0	0.0
Ledge Site:	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
.ighthouse Cove:	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pintlowes Cove:	--	0.0	10.7	0.0	0.0	0.0	0.0	0.0	18.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Blank page inserted to maintain continuity.

APPENDIX D:

Supplementary Information for Chapter 6.

TABLE D-1: Bliss Islands master species list for faunal analysis.

Class:	Order:	Family:	Genus species:	Common name:	Abbr.
Vertebrates:					
Mammalia:					
	Rodentia	Sciuridae		squirrel	Sci.
		Castoridae	Castor canadensis	American beaver	C.c.
		Muridae	Ondatra zibethicus	muskrat	O.z.
			Microtus sp.	vole	Mic.
			Microtus pennsylvanicus	meadow vole	M.p.
		Erethizontidae	Erethizon dorsatum	American porcupine	E.d.
	Cetacea			whale	Cet.
		Delphinidae	Phocoena phocoena	harbour porpoise	P.p.
	Carnivora	Canidae	Canis sp.	dog, wolf	Can.
			Canis familiaris	domestic dog	C.f.
		Ursidae	Ursus americanus	black bear	U.a.
		Procyonidae	Procyon lotor	raccoon	P.l.
		Mustelidae		mink, marten or otter	Mus.
			Martes americana	American marten	Ma.am.
			Lutra canadensis	river otter	L.c.
	Pinnipedia	Phocidae	Phoca vitulina	harbour seal	P.v.
			Halichoerus grypus	grey seal	H.g.
	Artiodactyla	Cervidae	Alces alces	American moose	A.a.
			Rangifer tarandus	woodland caribou	R.t.
			Odocoileus virginianus	white-tailed deer	O.v.
		Bovidae	Bos taurus	domestic cattle	B.t.
			Ovis aries	domestic sheep	O.a.
			Sus scrofa	domestic swine	S.s.
	Primates	Hominidae	Homo sapiens	human	H.s.

TABLE D-1 cont'd:

Aves:

Ciconiiformes	Ardeidae	Ardea herodias	great blue heron	A.h.
Anseriformes	Anatidae		duck or goose	Ana.
		Mergus merganser	common merganser	Me.me.
		Mergus serrator	red-breasted merganser	M.s.
		Lophodytes cucullatus	hooded merganser	Lo.cu.
		Bucephala clangula	common goldeneye	B.c.
		Anas acuta	pintail	An.ac.
		Anas rubripes	black duck	A.r.
		Somateria mollissima	common eider	S.m.
		Branta canadensis	Canada goose	Br.ca.
Falconiformes	Cathartidae	Haliaeetus leucocephalus	bald eagle	H.l.
Galliformes	Tetraonidae		grouse or ptarmigan	Tet.
		Bonasa umbellus	ruffed grouse	Bo.um
		Canachites canadensis	spruce grouse	Ca.ca.
Charadriiformes	Laridae		gull	Lar.
	Alcidae		shorebird	Alc.
		Pinguinus impennis	great auk	P.i.
		Uria sp.	murre	Uri.
		Uria lomvia	common murre	U.l.
Columbiformes	Columbidae	Ectopistes migratorius	passenger pidgeon	E.m.
Strigiformes	Tytonidae	Bubo virginianus	great horned owl	B.v.
Passeriformes	Corvidae	Corvus brachyrhynchos	common crow	C.b.

TABLE D-1 cont'd:

Osteichthyes:

small fish:					S.F.
	Clupeiformes	Clupeidae		herring	Clu.
	Gadiformes	Gadidae		cod (small)	G.S.
medium fish:					
	Percoformes	Cottidae	Myoxocephalus sp.	sculpin	Myo.
			Myoxocephalus octodecemspinosus	longhorn sculpin	M.o.
large fish:					L.F.
	Acipenseriformes	Acipenseridae	Acipenser oxyrhynchus	Atlantic sturgeon	A.o.
	Lophiiformes	Lophiidae	Lophius americanus	monkfish	L.a.
	Gadiformes	Gadidae		cod (large)	G.L.
			Gadus morhua	Atlantic cod	G.m.
			Pollachius virens	harbour pollock	Po.vi
			Melanogrammus aeglefinnus	haddock	Me.ae.
			Urophycis sp.	hake	Uro.

TABLE D-1 cont'd:

Invertebrates:

Mollusca:

Gastropoda	Acmaeidae	Acmaea testudinalis	tortoise-shell limpet	A.t.
	Thaididae	Nucella lapillus	Atlantic dogwhelk	N.l.
	Buccinidae	Buccinum undatum	Northern whelk	B.u.
		Neptunea decemcostata	ten-ridged whelk	N.d.
		Colus stimpsoni	Stimpson's whelk	C.s.
	Littorinidae	Littorina saxatilis	rough periwinkle	L.s.
		Littorina obtustata	round periwinkle	L.o.
		Littorina littorea	common periwinkle	L.l.
Pelecypoda	Myidae	Mya arenaria	soft-shelled clam	M.a.
		Hiatella arctica	Arctic saxicave	H.a.
	Pectinidae	Placopecten magellanicus	deep-sea scallop	P.m.
	Mytilidae	Modiolus modiolus	horse mussel	M.m.
		Mytilus edulis	common mussel	M.e.
		Crenella glandula	bean mussel	C.g.

Arthropoda:

Crustacea	Balanidae	Balanus sp.	barnacle	Bal.
		Balanus balanus	acorn barnacle	B.b.
		Balanus balanoides	common barnacle	Ba.ba.

Echinodermata:

Echinoidea	Strongylocentrotidae	Strongylocentrotus droebachiensis	green sea urchin	S.d.

TABLE D-2: Bliss Islands faunal distribution--zoological classes by piece count and density.

Provenience: site:	unit:	mammal:	avian:	fish (L&M):	fish (S):	Totals:	Density:
Camp:	area I	178	20	139	12	349	160.09
	area II	310	183	245	7	745	284.35
	area III	591	72	656	5	1324	708.02
	area IV	447	136	190	2	775	250.81
	totals:	1526	411	1230	26	3193	327.15
	layer 4	78	8	15	0	101	32.90
	layer 3	602	113	496	12	1223	320.16
	layer 2	658	254	679	12	1603	648.99
	layer 1	146	26	36	1	209	522.50
	totals:	1484	401	1226	25	3136	321.31
Weir:	s.c. 4	271	67	138	117	593	208.07
	s.c. 3	1549	66	506	5708	7829	1283.44
	s.c. 2	284	26	552	2	864	294.88
	s.c. 1	63	3	191	1	258	344.00
	totals:	2167	162	1387	5828	9544	755.66
Northeast Point:	--	1	0	0	0	1	3.33
Ledge Site:	--	0	0	0	1	1	1.82
Lighthouse Cove:	--	3	3	4	0	10	16.67
Pintlowes Cove:	--	3	2	0	0	5	16.67

TABLE D-4

****
LIVING CLOSE TO THE LEDGE

Uro.
0
0
1
0
1
0
0
0
0
0
0
0
0
0

TABLE D-6: Meat to MNI ratios used to convert faunal individuals to equivalent me

Species:	Ratio (kg:MNI=1):
Mammals:	
C.c.	17.50
C.f.	5.60
U.a.	87.50
O.z.	0.88
Ma.am.	1.20
L.c.	5.60
P.v.	67.00
H.g.	150.00
A.a.	150.00
R.t.	77.00
O.v.	45.00
Birds:	
A.h.	5.60
Me.me.	1.00
M.s.	1.00
Lo.cu.	1.00
B.c.	1.00
A.r.	1.00
S.m.	1.00
Ana. (l)	2.00
Ana. (s)	1.00
H.l.	2.20
Tet.	0.50
Bo.um.	0.50
Ca.ca.	0.50
C.b.	0.40
E.m.	0.20
B.v.	1.10
P.i.	11.50
U.l.	0.70
Fish:	
Clu.	0.40
G.S.	0.40
M.o.	0.80
A.o.	6.30
G.m.	3.50
Po.vi.	3.10
Me.ae.	3.20
Uro.	3.50
G.L.	3.50

TABLE D-7: Bliss Islands faunal distribution--invertebrate species by shell weight (kg).

Provenience: site:	unit:	M.a.	M.m.	M.e.	N.l.	B.u.	S.d.	other	
		Invertebrate Species:							
Camp:	layer 4	189.49	+	+	+	0.31	0.08	0.61	
	layer 3	513.28	41.07	+	+	27.60	0.47	8.57	
	layer 2	195.50	7.76	0.00	0.00	+	+	0.86	
	layer 1	15.71	0.00	0.00	0.00	0.00	0.00	0.00	
	totals:	913.98	48.83	0.00	0.00	27.91	0.55	10.04	1001.31
Weir:	s.c. 4	386.55	102.34	3.66	3.08	34.37	219.31	0.32	
	s.c. 3	1196.44	793.08	95.67	20.69	17.97	987.38	113.75	
	s.c. 2	603.92	97.81	1.71	9.18	0.98	490.04	7.32	
	s.c. 1	21.24	7.05	0.00	+	0.00	16.74	2.64	
	totals:	2208.15	1000.28	101.04	32.95	53.32	1713.47	124.03	5233.24
Northeast Point:	--	trace	0.00	0.00	0.00	0.00	0.00	0.00	0
Ledge Site:	--	16.75	0.23	0.00	+	0.00	6.05	0.23	23.26
Lighthouse Cove:	--	16.99	0.00	0.00	0.00	0.00	0.00	0.17	17.16
Pintlowes Cove:	--	7.13	0.00	0.00	0.00	0.00	0.00	0.07	7.2

TABLE D-8: Meat to shell ratios used to convert faunal remains to equivalent meat weights.

Species:	Ratio (meat:shell=1):
Gastropods:	
A.t	0.13
B.u.	0.60
N.l.	0.25
Pelecypods:	
M.a.	0.40
M.m.	0.18
M.e.	0.10
Echinoids:	
S.d.	0.18
other:	0.40

TABLE D-9: Grouping of faunal species by inferred subsistence strategies.

strategy number:	strategy description:	faunal species:
1)	intertidal zone; infauna; digging and gathering.	M. arenaria other clams
2)	intertidal zone; epifauna; gathering.	M. modiolus M. edulis A. testudinalis B. undatum N. lapillus B. balanus S. droebachiensis other mussels, whelks, winkles and barnacles
3)	intertidal zone; small fish; nets? weirs?	Clupeidae small Gadidae other small fish
4)	intertidal and inshore waters; medium and large fish; leisters? hook and line? traps?	Myoxocephalus sp. M. octodecemspinosus A. oxyrhynchus Anguilliformes G. morhua P. virens M. aeglefinnus Urophycis sp.
5)	forest; terrestrial birds; nets? traps? bow and arrow?	B. umbellus C. canadensis other grouse
6)	shoreline and intertidal zone; shorebirds, raptors, and scavenging birds; nets? traps? bow and arrow?	A. herodias P. impennis Uria sp. Uria lomvia Alcidae Laridae C. brachyrhynchos

		H.leucocephalus B. virginianus
7)	marshes and inshore waters; water fowl and other migratory birds; nets? traps? bow and arrow?	Anatidae M. merganser M. serrator L. cucullatus B. clangula A. acuta A. rubripes S. mollissima B. canadensis
8)	intertidal and inshore waters; sea mammals; spears? harpoons? strandings?	Cetacea P. phocoena P. vitulina H. grypus
9)	riverine and forest; artiodactyls; spears? bow and arrow?	A. alces R. tarandus O. virginianus
10)	riverine, forest, shorelines; small fur-bearing mammals; traps? bow and arrow?	Sciuridae O. zibethicus E. dorsatum C. canadensis P. lotor Mustelidae M. americana L. canadensis
11)	forest; large fur-bearing mammals; spears? traps?	U. americanus
12)	domestic animals.	Canis sp. C. familiaris

TABLE D-10: Calculation of niche width for the entire Weir site faunal assemblage.

subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	883.22	0.4191	0.1756
2)	M.m.	180.04		
	M.e.	10.11		
	N.l.	8.23		
	B.u.	31.97		
	S.d.	308.43		
	other	49.61		
	subtotal	588.39	0.2792	0.0780
3)	Clu.	1.20		
	G.S.	2.80		
	subtotal	4.00	0.0019	0.0000
4)	Myo.	0.80		
	G.m.	17.50		
	Po.vi.	12.40		
	G.L.	10.50		
	A.o.	6.30		
	L.F.	3.50		
	subtotal	51.00	0.0242	0.0006
5)	Tet.	0.50	0.0002	0.0000
6)	Lar.	0.50		
	Alc.	0.70		
	B.v.	1.10		
	Uri.	0.70		
	P.i.	11.50		
	subtotal	14.50	0.0069	0.0000
7)	E.m.	0.20		
	Ana. (l)	4.00		
	Ana. (s)	4.00		
	subtotal	8.20	0.0039	0.0000
8)	P.v.	134.00		
	H.g.	150.00		
	subtotal	284.00	0.1348	0.0182
9)	R.t.	77.00		
	O.v.	135.00		
	subtotal	212.00	0.1006	0.0101
10)	Mus.	3.00		
	L.c.	5.60		
	C.c.	35.00		
	Ma.am.	1.20		
	subtotal	44.80	0.0213	0.0005
11)	--	0.00	0.0000	0.0000
12)	Can.	5.60		
	C.f.	11.20		
	subtotal	16.80	0.0080	0.0001
Totals:		2107.41	1.0000	0.2830
			N.W. =	3.53

TABLE D-11: Calculation of niche width for Weir site stratigraphic component 4 faunal assemblage.

subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	154.62	0.4483	0.2010
2)	M.m.	18.42		
	M.e.	0.37		
	N.l.	0.77		
	B.u.	20.60		
	S.d.	39.48		
	other	0.13		
		------		
	subtotal	79.77	0.2313	0.0535
3)	G.S.	0.40	0.0012	0.0000
4)	G.m.	3.50	0.0101	0.0001
5)	--	0.00	0.0000	0.0000
6)	B.v.	1.10		
	Uri.	0.70		
	P.i.	11.50		
		------		
	subtotal	13.30	0.0386	0.0015
7)	E.m.	0.20		
	Ana. (l)	2.00		
	Ana. (s)	1.00		
		------		
	subtotal	3.20	0.0093	0.0001
8)	P.v.	67.00	0.1943	0.0377
9)	--	0.00	0.0000	0.0000
10)	C.c.	17.50	0.0507	0.0026
11)	--	0.00	0.0000	0.0000
12)	C.f.	5.60	0.0162	0.0003
Totals:		344.89	1.0000	0.2967
			N.W. =	3.37

****

LIVING CLOSE TO THE LEDGE

TABLE D-12: Calculation of niche width for Weir site stratigraphic component 3 faunal assemblage.

subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	478.57	0.3651	0.1333
2)	M.a.	142.75		
	M.e.	9.57		
	N.l.	5.17		
	B.u.	10.78		
	S.d.	177.73		
	other	45.50		
	subtotal	391.50	0.2987	0.0892
3)	Clu.	1.20		
	G.S.	2.40		
	subtotal	3.60	0.0027	0.0000
4)	Myo.	0.80		
	G.m.	3.50		
	Po.vi.	3.10		
	G.L.	3.50		
	L.F.	3.50		
	subtotal	14.40	0.0110	0.0001
5)	Tet.	0.50	0.0004	0.0000
6)	Lar.	0.50		
	Alc.	0.70		
	subtotal	1.20	0.0009	0.0000
7)	Ana. (l)	0.20		
	Ana. (s)	4.00		
	subtotal	4.20	0.0032	0.0000
8)	P.v.	67.00		
	H.g.	150.00		
	subtotal	217.00	0.1655	0.0274
9)	R.t.	77.00		
	O.v.	90.00		
	subtotal	167.00	0.1274	0.0162
10)	Mus.	3.00		
	L.c.	5.60		
	C.c.	17.50		
	Ma.am.	1.20		
	subtotal	27.30	0.0208	0.0004
11)	--	0.00	0.0000	0.0000
12)	C.f.	5.60	0.0043	0.0000
Totals:		1310.87	1.0000	0.2667
			N.W. =	3.75

TABLE D-13: Calculation of niche width for Weir site stratigraphic component 2 faunal assemblage.

subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	241.53	0.5861	0.3435
2)	M.m.	17.60		
	M.e.	0.17		
	N.l.	2.29		
	B.u.	0.59		
	S.d.	88.21		
	other	2.93		
		------		
	subtotal	111.79	0.2713	0.0736
3)	--	0.00	0.0000	0.0000
4)	G.m.	3.50		
	Po.vi.	9.30		
		------		
	subtotal	12.80	0.0311	0.0010
5)	--	0.00	0.0000	0.0000
6)	--	0.00	0.0000	0.0000
7)	Ana. (s)	1.00	0.0024	0.0000
8)	--	0.00	0.0000	0.0000
9)	O.v.	45.00	0.1092	0.0119
10)	--	0.00	0.0000	0.0000
11)	--	0.00	0.0000	0.0000
12)	--	0.00	0.0000	0.0000
Totals:		412.12	1.0000	0.4299
			N.W. =	2.33

****
LIVING CLOSE TO THE LEDGE

TABLE D-14: Calculation of niche width for Weir site stratigraphic component 1 faunal assemblage.

subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	8.50	0.2139	0.0458
2)	M.m.	1.27		
	S.d.	3.01		
	other	1.05		
	subtotal	5.33	0.1342	0.0180
3)	--	0.00	0.0000	0.0000
4)	G.m.	7.00		
	Po.vi.	7.00		
	A.o.	6.30		
	subtotal	20.30	0.5109	0.2611
5)	--	0.00	0.0000	0.0000
6)	--	0.00	0.0000	0.0000
7)	--	0.00	0.0000	0.0000
8)	--	0.00	0.0000	0.0000
9)	--	0.00	0.0000	0.0000
10)	--	0.00	0.0000	0.0000
11)	--	0.00	0.0000	0.0000
12)	Can.	5.60	0.1410	0.0199
Totals:		39.73	1.0000	0.3447
			N.W. =	2.90

TABLE D-15: Calculation of niche width for the entire Camp site faunal assemblage.

subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	283.51	0.3545	0.1257
2)	M.m.	9.81		
	S.d.	0.09		
	B.u.	6.90		
	other	0.90		
	subtotal	17.70	0.0221	0.0005
3)	Clu.	0.80	0.0010	0.0000
4)	G.m.	7.00		
	Po.vi.	3.10		
	Me.ae.	3.20		
	Uro.	3.50		
	subtotal	16.80	0.0210	0.0004
5)	Bo.um.	0.50		
	Ca.ca.	0.50		
	subtotal	1.00	0.0013	0.0000
6)	C.b.	0.40		
	H.l.	2.20		
	A.h.	5.60		
	U.l.	0.70		
	P.i.	11.50		
	subtotal	20.40	0.0255	0.0007
7)	Me.me.	1.00		
	M.s.	1.00		
	Lo.cu.	1.00		
	B.c.	1.00		
	A.r.	1.00		
	S.m.	1.00		
	subtotal	6.00	0.0075	0.0001
8)	P.v.	67.00	0.0838	0.0070
9)	A.a.	150.00		
	R.t.	77.00		
	O.v.	45.00		
	subtotal	272.00	0.3401	0.1157
10)	C.c.	17.50	0.0219	0.0005
11)	U.a.	87.50	0.1094	0.0120
12)	C.f.	9.60	0.0120	0.0001
Totals:		799.81	1.0000	0.2626
			N.W. =	3.81

TABLE D-16: Calculation of niche width for Camp site layer 3 faunal assemblage.

subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	205.31	0.4115	0.1693
2)	M.m.	8.21		
	S.d.	0.09		
	B.u.	6.90		
	other	0.80		
	subtotal	16.00	0.0321	0.0010
3)	--	0.00	0.0000	0.0000
4)	G.m.	3.50		
	Po.vi.	3.10		
	Me.ae.	3.20		
	subtotal	9.80	0.0196	0.0004
5)	Bo.um.	0.50		
	Ca.ca.	0.50		
	subtotal	1.00	0.0020	0.0000
6)	H.l.	2.20		
	P.i.	11.50		
	subtotal	13.70	0.0275	0.0008
7)	M.s.	1.00		
	B.c.	1.00		
	A.r.	1.00		
	subtotal	3.00	0.0060	0.0000
8)	--	0.00	0.0000	0.0000
9)	A.a.	150.00		
	R.t.	77.00		
	subtotal	227.00	0.4550	0.2070
10)	C.c.	17.50	0.0351	0.0012
11)	--	0.00	0.0000	0.0000
12)	C.f	5.60	0.0112	0.0001
Totals:		498.91	1.0000	0.3799
			N.W. =	2.63

TABLE D-17: Calculation of niche width for Camp site layer 2 faunal assemblage.

subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	78.20	0.2599	0.0675
2)	M.m.	1.60		
	other	0.10		
	subtotal	1.70	0.0056	0.0000
3)	Clu.	0.80	0.0027	0.0000
4)	G.m.	3.50		
	Uro.	3.50		
	subtotal	7.00	0.0233	0.0005
5)	--	0.00	0.0000	0.0000
6)	C.b.	0.40		
	A.h.	5.60		
	U.l.	0.70		
	subtotal	6.70	0.0223	0.0005
7)	Me.me.	1.00		
	Lo.cu.	1.00		
	S.m.	1.00		
	subtotal	3.00	0.0100	0.0001
8)	P.v.	67.00	0.2227	0.0496
9)	O.v.	45.00	0.1496	0.0224
10)	--	0.00	0.0000	0.0000
11)	U.a.	87.50	0.2908	0.0846
12)	C.f.	4.00	0.0133	0.0002
Totals:		300.90	1.0000	0.2254
			N.W. =	4.44

****
LIVING CLOSE TO THE LEDGE

TABLE D-18: Calculation of niche width for the Lighthouse Cove site faunal assemblage.

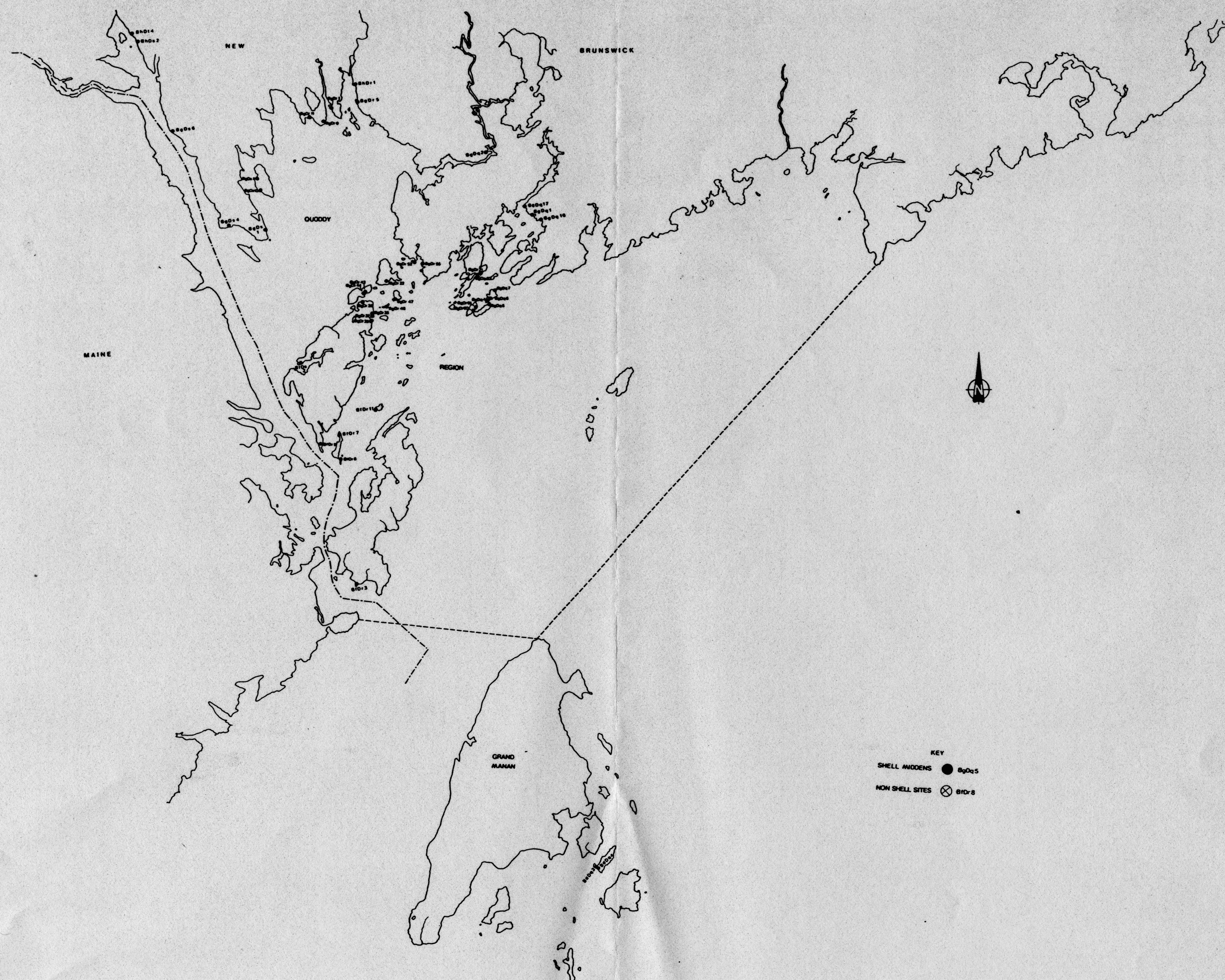
subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	6.80	0.3784	0.1432
2)	other	0.07	0.0039	0.0000
3)	--	0.00	0.0000	0.0000
4)	G.L.	3.50	0.1948	0.0379
5)	--	0.00	0.0000	0.0000
6)	--	0.00	0.0000	0.0000
7)	Ana.	2.00	0.1113	0.0124
8)	--	0.00	0.0000	0.0000
9)	--	0.00	0.0000	0.0000
10)	--	0.00	0.0000	0.0000
11)	--	0.00	0.0000	0.0000
12)	C.f.	5.60	0.3116	0.0971
Totals:		17.97	1.0000	0.2906
			N.W. =	3.44

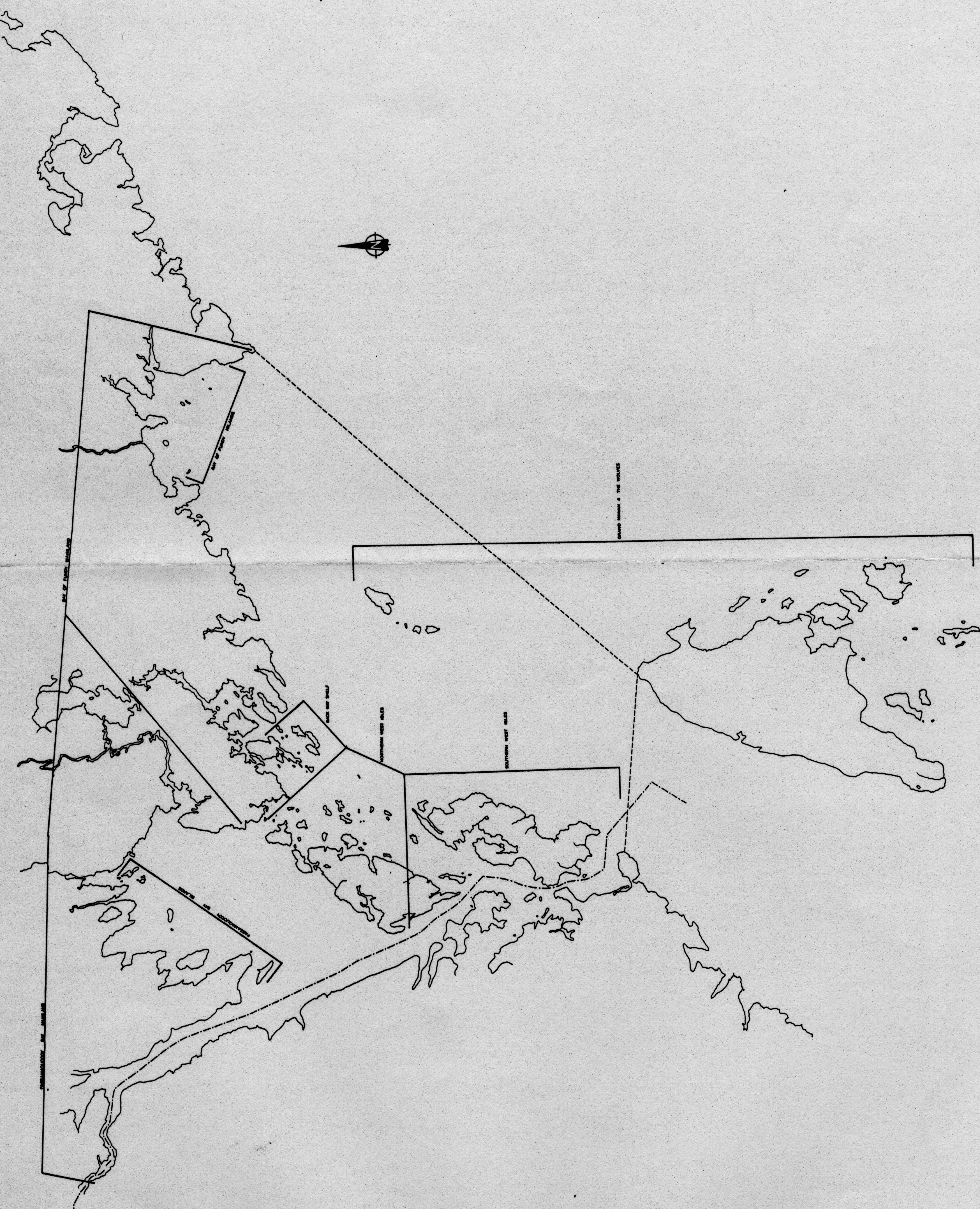
TABLE D-19: Calculation of niche width for the Pintlowes Cove site faunal assemblage.

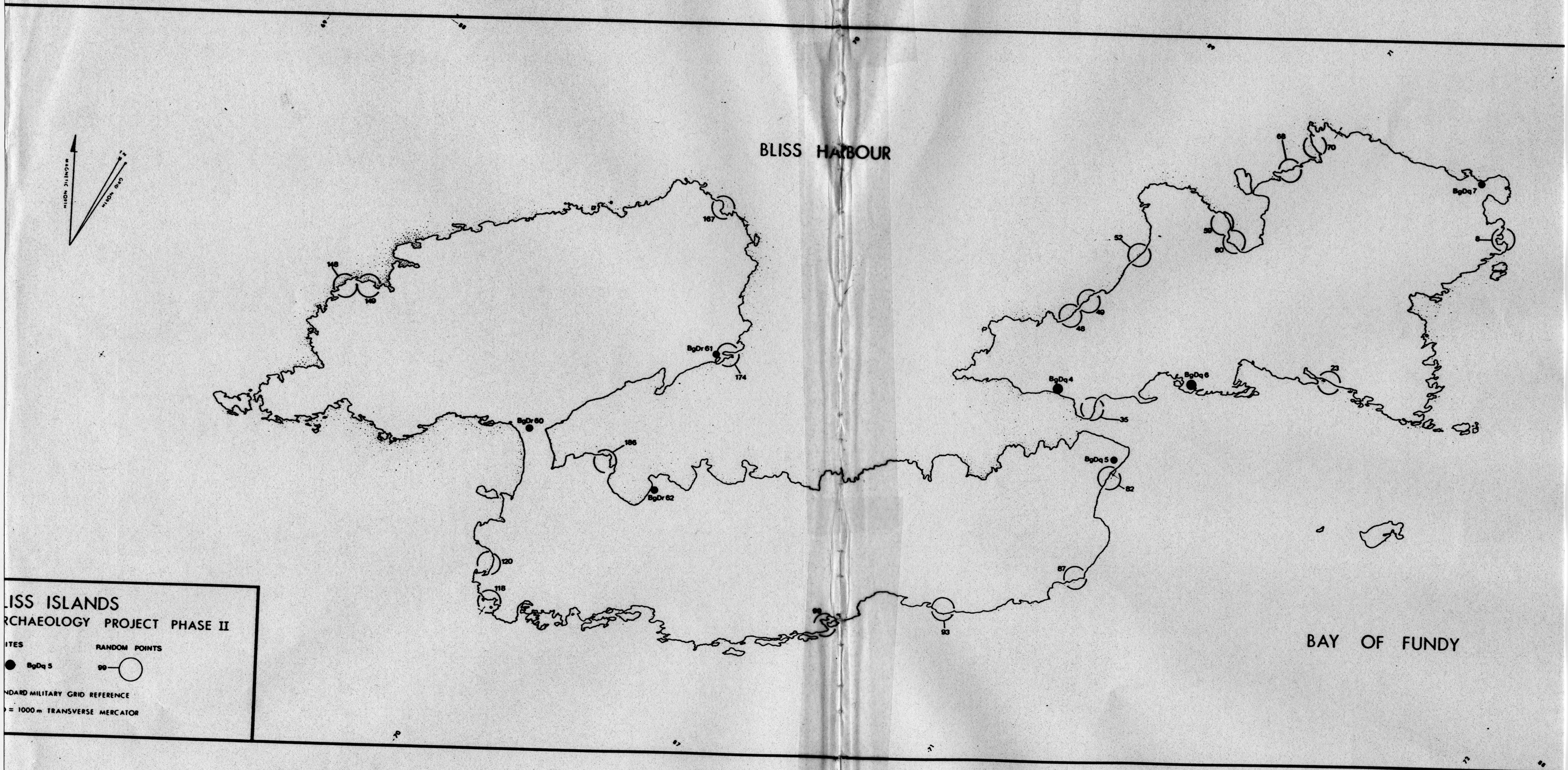
subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	2.85	0.7345	0.5395
2)	other	0.03	0.0077	0.0001
3)	--	0.00	0.0000	0.0000
4)	--	0.00	0.0000	0.0000
5)	--	0.00	0.0000	0.0000
6)	--	0.00	0.0000	0.0000
7)	Ana.	1.00	0.2577	0.0664
8)	--	0.00	0.0000	0.0000
9)	--	0.00	0.0000	0.0000
10)	--	0.00	0.0000	0.0000
11)	--	0.00	0.0000	0.0000
12)	--	0.00	0.0000	0.0000
Totals:		3.88	1.0000	0.6060
			N.W. =	1.65

TABLE D-20: Calculation of niche width for the Ledge site faunal assemblage.

subsistence strategy:	species:	amount (kg):	proportion:	square:
1)	M.a.	6.70	0.8053	0.6485
2)	M.m.	0.04		
	S.d.	1.09		
	other	0.09		
	subtotal	1.22	0.1466	0.0215
3)	Clu.	0.40	0.0481	0.0023
4)	--	0.00	0.0000	0.0000
5)	--	0.00	0.0000	0.0000
6)	--	0.00	0.0000	0.0000
7)	--	0.00	0.0000	0.0000
8)	--	0.00	0.0000	0.0000
9)	--	0.00	0.0000	0.0000
10)	--	0.00	0.0000	0.0000
11)	--	0.00	0.0000	0.0000
12)	--	0.00	0.0000	0.0000
Totals:		8.32	1.0000	0.6723
			N.W. =	1.49


NEW
BRUNSWICK
MAINE
QUODDY
REGION
GRAND
MANAN
KEY
SHELL MIDDENS
NON SHELL SITES


GRAND MANAN & THE WOLVES
BAY OF FUNDY ISLANDS
BAY OF FUNDY MAINLAND
BACK BAY SHELF
NORTHERN WEST ISLES
SOUTHERN WEST ISLES
PASSAMAQUODDY BAY ISLANDS
PASSAMAQUODDY BAY MAINLAND



BLISS HARBOUR
BAY OF FUNDY
LISS ISLANDS
RCHAEOLOGY PROJECT PHASE II
ITES
BgDq 5
RANDOM POINTS
99
NDARD MILITARY GRID REFERENCE
= 1000 m TRANSVERSE MERCATOR
GRID NORTH
MAGNETIC NORTH
BgDr 60
BgDr 61
BgDr 62
BgDq 4
BgDq 5
BgDq 6
BgDq 7
148
149
167
174
186
120
118
99
93
87
82
35
48
49
52
59
60
68
70
23
8