

Labrador Inuit Subsistence in the Context of Environmental Change: An Initial Landscape History Perspective

ABSTRACT In this article, I examine the subsistence economy of the contact period Labrador Inuit (17th to 19th century) to investigate the relationships of elements of specific cultural changes to environmental change, the effects of cultural interactions, and internal social processes. I apply paleoclimate and sea-ice records and zooarchaeological studies of life history and seasonality of ecologically sensitive species to reconstruct histories of change in particular elements of the physical landscape and of their use. I associate the use of communal houses by the Labrador Inuit and their modification of settlement patterns during the 18th century to a limited phase of environmental moderation and stability during the Little Ice Age and suggest that these changes reflect, in part, economic strategies oriented toward surplus production. [Keywords: Labrador Inuit, Little Ice Age, sea ice, environmental archaeology, historical ecology]

A PERSISTENT THEME in archaeological research has been the evaluation of the influence of environmental impacts on economies, technologies, and social organization. Archaeologists have frequently employed cultural ecology as a central theoretical perspective, interpreting cultural phenomena in terms of adaptations to external environmental stimuli, working in long-time scales (reflecting Braudel's [1972] environmentally framed *longue durée*) and functionalist cultural systems in which cultural variables are minimized and cultural agents tend to disappear (Brumfiel 1992). Nevertheless, many of the phenomena (such as technological innovations, cycling of chiefly polities, or economic decision making) and situations (cultural contact and colonization) that actively motivate archaeological research are those that operate or are dynamic within shorter time scales, within the span of single generations, careers, or short-term events (the equivalents of the *conjoncture* and *événement*, as defined by Braudel [1972]). Conversely, although archaeologists have, in recent years, applied the concept of agency to such subjects, they have often left out the environmental context of short-term events. As observed by Elizabeth M. Brumfiel (1994), it has proven difficult to maintain both social and environmental contingencies in the same analysis.

Recent ice-core research provides ample demonstration of the remarkable potential scale of interannual climatic variation and that important climate changes of the past sometimes took place over very short-time peri-

ods (Johnsen et al. 1997; Meese et al. 1994). Anthropological research also illustrates that cultural actors are instrumental in both ushering in and mitigating ecological catastrophes (Balée 1999; Berkes and Folke 1998; Finlayson and McCay 1998). The historical ecology perspective (Balée 1999; Crumley 1994, 1999; Hardesty and Fowler 2001) incorporates both agents and the environmental context of their action and the consideration of shorter and longer time scales. As such, it appears particularly useful to understand culture-environment interactions implicated in current global change phenomena and in the archaeologically reconstructed past.

In this article, I attempt to incorporate elements of historical ecology approaches to the archaeological examination of the changing character of Inuit subsistence economies and social organization in Labrador, northern Canada, from the 16th to the 19th century C.E. During the last few hundred years, the Labrador Inuit have faced many different challenges in the reproduction of their society. Those of the last 100 years may well be the most dramatic and best documented, involving profound threats to the retention of language and tradition, settlement relocations, political marginalization, industrial and colonial encroachment on land tenure, market and fish-stock collapses, and rapid ecological change, among other phenomena (Brice-Bennett 1977, 1981; Environmental Assessment Panel 1999; Williamson 1997). These factors have all posed problems for the reconstitution of Inuit society through the reproduction

of age, gender, and occupation roles traditionally oriented around the production of subsistence resources and on the transmission and application of traditional environmental knowledge on which such subsistence economies depend. A conspicuous Inuit response to these problems has been the development of cooperative and corporate community institutions dealing with specific issues and the pursuit of claims of aboriginal title, which have resulted in the recent settlement of a territorial land claim and establishment of self-government institutions.

Many of the problems prominent in modern Labrador have, nevertheless, parallels or direct roots in processes of the 17th and 18th century, especially those posed by cultural interactions and environmental change. During this time, Inuit were engaged in initial but increasingly pervasive cultural contacts and economic exchanges with Europeans that saw Inuit occupation of some coastal areas contested by violence in southern Labrador and by the establishment of missionary settlements in the north. In addition, Labrador Inuit were faced with specific challenges stemming from a highly dynamic environment (the "Little Ice Age," hereafter LIA), which undoubtedly compromised seasonal travel and the procurement of critical animal resources, especially those responsive to changing sea-ice conditions. The North Atlantic region comprises one of the earth's most variably climate systems, while the LIA saw the northern hemisphere's sharpest environmental fluctuations and most severe cooling episodes of the last 6,000 years (Dansgaard et al. 1993; Mayewski et al. 1994; Meese et al. 1994). Given the long-standing interest among archaeologists in evaluating the importance of such factors as motivations for culture change, and the possibility of merging well-preserved zooarchaeological records of subsistence with recent high-resolution paleoclimate records, Labrador presents a useful case study for examining the how economic strategies may be employed to facilitate social reproduction in uncertain times.

The present article is based on zooarchaeological analysis of Uivak Point, a recently excavated Inuit winter settlement (Kaplan and Woollett 2000; Woollett 2003) and on several other previously excavated winter settlements in the locality of Hamilton Inlet (Jordan 1977). The locations of these sites is presented in Figure 1. The zooarchaeological studies I conducted earlier (Woollett 1999, 2003) were intended to determine if Labrador Inuit winter subsistence practices of the 17th to 19th century were affected by sea-ice changes and what use was made of secondary subsistence resources. Additional goals for the analyses were to determine if Inuit continued to hunt whales in the late 18th century and if economic shortfalls accompanied the LIA. Zooarchaeological studies were bolstered by archeobotanical, archeoentomological, and dendrochronological analyses, as well as the amalgamation of these data with published ethnohistorical data and recent high-resolution paleoenvironmental records. Reconstructions of histories of landscape change and of Inuit land-use practices facilitated by this multidisciplinary research program are used to reex-

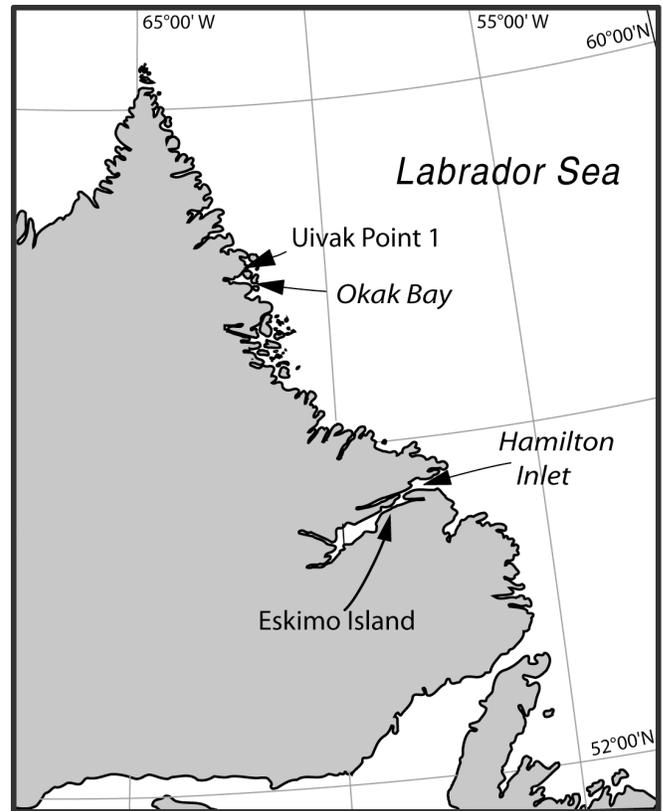


FIGURE 1. Map of Labrador showing the locations of archaeological sites mentioned in the text.

amine existing hypotheses of Labrador Inuit culture change during the contact period. These hypotheses have emphasized particular changes such as the adoption of communal winter residence patterns and have interpreted them primarily in terms of ecological adaptation, property relations, and social aggrandizement.

RESEARCH QUESTION: LABRADOR INUIT CULTURAL REALIGNMENT DURING THE LIA AND THE CONTACT PERIOD

Through a substantial body of research accumulated since the 1940s, archaeologists and ethnohistorians have described a set of cultural developments that appear to distinguish the Labrador Inuit from the Inuit groups of the Central Canadian Arctic who figure prominently in classic anthropological works. These changes include the following: modified settlement patterns; possible population growth; the realignment and centralization of households through the adoption of multifamily, "communal," winter residences; the apparent emphasis of polygyny (and the subsequent abandonment of these practices); increasing involvement in trade and possible intensification of economic production; and apparent displays of wealth and social authority (Bird 1945; Jordan 1974, 1977, 1978; Jordan and Kaplan 1980; Kaplan 1983; Schledermann 1976b; Taylor 1974). Through these developments, in association with relatively sedentary winter settlement patterns emphasizing transport and storage of subsistence resources, the

Labrador Inuit appear to have manifested some of the characteristics typically associated with complex or transegalitarian hunter-gatherers.

Some researchers have also proposed a set of competing hypotheses to account for the ostensible historical distinctiveness of the Labrador Inuit, the most widely discussed of which postulate that developments such as the communal house were adaptive reactions to drastic environmental deterioration in the 17th century (Schledermann 1976a, 1976b; also Richling 1993), to social processes facilitating accumulation of wealth and prestige encouraged by contact with Europeans and trade (Jordan 1974, 1978), or to a complex mix of environmentally and socially contingent factors (Kaplan 1983, 1985; Taylor 1974; Woollett 1999, 2003).

Although the historical and social contexts of the contact period have been examined in increasingly nuanced terms in several more recent studies, debates over the character and motivations of the contact period cultural changes persist. The contact period Labrador Inuit have been proposed as a potential analogue for the Thule society in the Canadian Central Arctic (McGhee 1984:83), a group that had a relatively hierarchical society with a capacity for aggrandizement based on whale hunting (Whitridge 1999), and also as stereotypically egalitarian hunter-gatherers (Schledermann 1976b). A better understanding of the particular case study presented by the Labrador Inuit would accordingly provide an opportunity to better understand the variability amongst the closely related Inuit cultural groups and of the relationship of this variability to external environmental limitation.

Despite their mutually exclusive nature, most of the major hypotheses related to contact period cultural change in Labrador posit specific economic and environmental criteria and rely on arguments built on patterns of land use that are thought to have succeeded in the past. Nevertheless, the burden of evidence for these hypotheses has, until recently, been based largely on historical texts, contemporary land-use studies, and archaeological surveys. All of these are highly pertinent sources of data for the problem at hand but are necessarily problematic sources of the detailed and generalizable primary economic data needed to make effective use of recent high-resolution paleoenvironmental records. Alternative sources of economic evidence can be obtained through studies of large, well-preserved assemblages of animal and plant remains from well-dated archaeological sites, which, as residues of exploited subsistence resources and of their procurement, processing, distribution, and consumption, represent proxies for the economic activities actually conducted at archaeological sites (Amorosi et al. 1996).

LABRADOR INUIT CULTURE CHANGES IN THE CONTACT PERIOD

The Labrador-Ungava peninsula, the extreme northeastern-most extension of the Canadian continental landmass, was the southeastern-most limit of the migration of the

Thule people throughout the North American Arctic and Greenland some 1,000 to 600 years ago. The Thule, ancestors of the modern Inuit, arrived in northern Labrador by the late 13th to early 15th centuries (Fitzhugh 1994; McGhee 1999; Morrison 1989). This migration produced several relatively isolated, territorially defined groups (called Modified Thule), which are characterized by incipient distinctions in modes of stylistic expression, subsistence, and settlement patterns (McGhee 1994). This process of regional differentiation and specialization continued into the historic period, with modern Inuit groups distinguished in a similar fashion, by dialects, material culture, technologies, and economic specializations suited to the ecology of their home regions. In Labrador, the Modified Thule–Historic Inuit transition is conventionally dated to the 17th to 18th century (Kaplan 1983) and comprises the suite of culture changes considered in this article. The Thule–Inuit transition occurred during the highly variable climatic situation of the LIA. Accordingly, the Labrador Inuit and their Thule ancestors settled themselves in what is, in ecological and cultural terms, likely the most diverse and rich region of the Eastern Arctic, near the onset of a period of extreme environmental variability and social change.

The Labrador Inuit employed many of the same highly flexible social and economic institutions and practices well known amongst Inuit elsewhere in the Arctic to cope with this challenging setting and to exploit the opportunities it provided. Nevertheless, they may have also developed some of the behaviors typically associated with status-conscious, transegalitarian hunter-gatherers, notably with the possibilities for competition for leadership and wealth differentiation provided by adoption of multifamily, “communal” winter residences and an apparent emphasis of polygyny and intensification of economic production to provide storable and tradable surpluses (Bird 1945; Jordan 1974, 1977; Jordan and Kaplan 1980; Kaplan 1983; Schledermann 1976b; Taylor 1974). The contact period Labrador Inuit have been proposed as a comparable example for the Thule society in the Canadian Central Arctic (McGhee 1984:83), a group that had a relatively hierarchical society with a capacity for aggrandizement based on whale hunting (Whitridge 1999) and also as stereotypically egalitarian hunter-gatherers (Schledermann 1976b). A better understanding of the particular case study presented by the Labrador Inuit would accordingly provide an opportunity to better understand the variability amongst the closely related Inuit cultural groups and of the relationship of this variability to external environmental limitation.

Since the 1940s, archaeologists and ethnohistorians have examined various elements of post-Thule cultural and social change thought to be distinctive of the Inuit of Labrador. Among these, the adoption of communal winter households, changing settlement patterns, population growth, changing hunting, exchange and trade practices, and changing roles of social distinction have figured most prominently in the literature.

In Labrador, Thule-period winter sod houses were ovoid to subrectangular structures with tunnel-like entrance passages and floor areas ranging from about 12–20 square meters (Kaplan 1983:220–223, 234), which likely housed one or two small family groups (Maxwell 1985:288). These houses were light and heated with sea mammal fat burned in stone lamps set on lamp stands, and they often had cooking and storage alcoves within the entrance passage. Some more complex house structures existed, usually having two living chambers with sleeping platforms conjoined by a common entrance passage.

By the early 18th century, if not by the late 17th century, the Inuit in Labrador and Greenland adopted the use of a different winter house structure: It had the same basic architectural components as the Thule house but with a much larger floor area (approximately 40m² to 130m²), and it was comprised of multiple or partitioned sleeping platforms, multiple lamp stands, internal cooking areas, and a large open floor space (Bird 1945; Gulløv 1997; Jordan 1974, 1977; Kaplan 1983; Petersen 1974–75; Schledermann 1975, 1976b). Smaller, multiroom communal structures were also used by Inuit in Baffin Island and the Ellesmere Island region, suggesting a wider distribution of variants of the communal house form (Schledermann 1975, 1996).

Ethnohistorical sources from Labrador and Greenland describe these dwellings as home to multiple families with as many as 35 inhabitants (Petersen 1974–75; Taylor 1974:15), each family having a specific platform area and lamp stand. This so-called communal house represents an amplification of the older winter house form to incorporate the domestic and working space of whole winter communities, or large parts thereof, and the reorganization of these communities from a cellular assemblage of family units into more centrally organized composite groups. J. Garth Taylor's (1974) ethnohistorical study of 18th-century Labrador Inuit suggests that social units occupying communal houses comprised multiple nuclear families organized in terms of virilocal kindreds (*ilagiit*; see Taylor 1974:76). Senior individuals at the center of interfamilial and intergenerational relationships played important roles in the kindred structure, especially senior males. The communal house residence pattern appears to have been in use into the early- to mid-19th century in Labrador and was gradually replaced by a return to smaller households and smaller family units, by dispersed settlement patterns, and, eventually, by European-style house structures (Kaplan 1983:244).

Winter settlement patterns changed in Labrador alongside the adoption of the communal house. Susan Kaplan (1983) demonstrated that, during the Thule period (up to the 17th century), semisedentary winter settlements with sod houses and temporary camps with tent rings or multi-tiered stone structures were generally located in outer bays and on exposed outer islands lying off the north Labrador coast. Locational analyses based on extensive regional surveys, historic land-use patterns, and contemporary resource distributions demonstrate that these sites are located amidst the seasonal migration routes of marine mammals, close to

the *sina* (the seaward edge of coastal land-fast sea ice) or to *polynyas* (pockets of water amidst sea ice that remain ice free in winter because of winds, currents, or upwelling), which are habitats for a variety of sea mammals and birds from fall to spring (Kaplan 1983:218, 288). This settlement pattern suggests that the Thule employed a specialized marine-hunting economy centered on relatively permanent winter settlements, particular seasonal pulses of resources, and logistical mobility. Initial and limited zooarchaeological studies of Thule sites appear to confirm this hypothesis (Kaplan 1983), as do more extensive studies of earlier Dorset sites in similar locations (Spiess 1978).

Kaplan's locational analysis (1983) also showed a much different settlement pattern for 18th-century Labrador Inuit winter settlements associated with communal houses. These sites are primarily located amongst the landward islands of coastal island clusters and in inner bays. These environments are more sheltered in winter, further from the *sina* but closer to mainland and terrestrial resources such as caribou, fish, fur-bearers, and wood. Temporary camps, by contrast, were located on islands closer to the *sina*. Kaplan (1983) proposed that this settlement pattern has been considered to be indicative of a more generalized subsistence economy, using a greater range of resources in all seasons and more terrestrial resources in general and more dependent on logistical mobility strategies with their attendant emphasis of storage and transportation infrastructure.

Several additional cultural and social changes of the period have also been noted. Some demographic data tentatively suggests that Inuit populations were increasing during the 18th century (Jordan 1977; Kaplan 1983), although this conclusion has since been challenged (Richling 1993). Census data collected by Moravian Missionaries and Royal Navy officers also suggests that adult males were relatively underrepresented because of differential mortality patterns (Taylor 1974:69). Polygynous marriages were relatively common in the 18th century, to a degree unusual amongst the Inuit generally (Taylor 1974). Situational leaders seem to have had more prominent social roles and the opportunity to extend their leadership roles into other social and economic spheres. Finally, the 18th century saw the initial development of permanent, year-round European presence on the northern Labrador coast, as Moravian missionaries established multiple posts from 1771 onward (Hiller 1968), from which they engaged in both evangelism and trade. These missionaries exerted increasing social and economic pressure on the Inuit, resulting in widespread conversions and relocation to mission settlements in the 19th century.

Climatic Change and Labrador Inuit Culture Change

Following Robert Petersen's earlier discussion of the near-contemporaneous adoption of communal houses in Greenland (Petersen 1974–75), Peter Schledermann (1976a, 1976b) proposed that the adoption of the communal house in Labrador was an adaptive response to climatic cooling

during the LIA. Pioneering paleoclimatic reconstructions (Bryson and Wendland 1967; Dansgaard et al. 1970) has demonstrated that an extended period of severe climatic cooling began by the late 16th century and lasted into the 18th century, dating and calibrating the LIA cooling phase theretofore known from glacial advances and historical records. Schledermann (1976a:40–41) concluded that sea ice on the Labrador coast would have been more extensive and long-lasting during the LIA. Noting the close biogeographic association of sea mammals to sea ice (Vibe 1967), Schledermann (1976a:40–41) inferred that more severe sea ice would have been a barrier that prevented sea mammals such as bowhead whales (and, to a lesser extent, harp seals) from feeding in and migrating through Labrador's coastal waters, while the habitat of seal species tolerant of complete ice cover was simultaneously increased.

Schledermann (1976b:34) argued that the bowhead whale was a critical resource for the Thule people in Labrador, as a hugely lucrative source of communally apportioned fuel and food. The collapse of dependable whale hunting in Labrador would have posed a serious provisioning problem for less-productive households, as the smaller species of seals that would have been available to replace whales in the subsistence economy would were typically shared within households (Weyer 1962). Households unfortunate enough to have fewer or less capable hunters were therefore more vulnerable to starvation. In this group selection model, coresidence of separate family units would have offered an opportunity to buffer economic insecurity by allowing a more efficient and broad distribution of the surplus of successful hunters throughout the local population, as economic effort necessarily became focused on seal hunting.

Social Theories for 18th-Century Labrador Inuit Culture Change

Contrary to Schledermann, Richard Jordan considered the development of the communal house in Labrador to have been the largely influenced by contact with Europeans. Specifically, he argued that multifamily households formed around entrepreneurial individuals who earned wealth and prestige as middlemen in trade with Europeans or as whale hunters (Jordan 1974, 1977). Jordan drew his conclusions from his excavations of a number of 17th-, 18th- and 19th-century winter houses in the Hamilton Inlet area, which showed a dramatic increase in house size during the 18th century followed by a reduction in size in the 19th century. Trade goods were recovered in all these excavations and were especially plentiful in the 18th and 19th century houses (Jordan 1974). Jordan saw these middlemen as people who utilized existing social roles of authority to organize the production of their kin, dominating exchange activity and accumulating wealth (Jordan 1977).

Trading opportunities were limited by lack of permanent local European establishments in northern Labrador before the later 18th century and by the short list of

local goods desired by Europeans, including baleen, whale oil, and furs (Brice-Bennett 1981; Cartwright 1792; Kaplan 1985). Consequently, transportation facilities and capacity to secure tradable surpluses would have given particularly able and enterprising individuals opportunities to dominate external trading activities and to negotiate the distribution of trade goods themselves. The essential talents required of putative aggrandizers included personal hunting skills, careers as leading successful whale-hunting ventures, and extensive alliance networks useful to marshal the surplus production of others. Asymmetrical exchange operating in association with limited trading opportunities and the expectation of reciprocity would have been a possible means of promoting indebtedness and inequality even in an egalitarian society (Hickey 1984).

Similarly, the multigenerational structure of most ethnohistorically described communal houses (Taylor 1974) would seem to indicate that the social groups living in communal houses likely had inherently hierarchical social structures, with the senior father–husband in a position of clear authority by virtue of claims to respect. The dominant role of a household head would likely also tend to be perpetuated through habitual assumption of leadership roles in activities outside the house, by their unequal negotiating power, and by their exertion of ownership or control over items of critical property. This might include critical facilities such as such as boats and corporately held resources.

Taylor also determined that these household heads were also frequently identified as boat owners and whale-hunting leaders, shamans, middlemen in long-distance trade networks, and arbiters in conflicts (Taylor 1974). They also usually had several wives and hence access to larger networks of consanguineal social alliances. They gained access to larger and more versatile labor pools capable of managing household production tasks such as food preparation, the sewing of skin clothing, food gathering, hunting small game, and crewing *umiat* (sing. *umiak*), multiperson skin boats used for hunting whales, amongst other purposes. These household heads appear to have been capable individuals who assumed *angajuqqaq* (lit., “Captain”; Taylor 1974:81), or leadership positions in a variety of economic spheres from whale hunting to trading expeditions. It is conceivable that they may also have translated economic authority into the more generalized social authority of the *isumataq* (“one who thinks”; see Oosten 1986; Stevenson 1997) of the Canadian Central Arctic through manipulation of kin relations, alliances, spiritual leadership, displays of wealth, and personality. If so, they would also resemble, in some respects, the Alaskan *umealiq*, or whaleboat owner (see Spencer 1959), as well as meet many of the qualities of an aggrandizer (Hayden 1995).

Kaplan (1983, 1985) built on the work of Jordan and Taylor by amalgamating ethnohistorically documented changes in economic practices with regional settlement patterns and resource distribution studies to make a diachronic study of Thule and Inuit subsistence economies. Kaplan made use of economic reconstructions, artifact studies, and

ethnohistorical sources to define the functioning of long-distance trading networks maintained by prominent Inuit middlemen. These individuals used European boats to move local products including baleen, oil, skins, and feathers to southern Labrador, where European trading posts and other establishments were to be found, and then returned European goods north. They recruited others to participate in these ventures, which sometimes took on aggressive raiding tactics as well (Kaplan 1983; Taylor 1979).

Alternative Hypotheses

Contact-period culture changes in Labrador have been reexamined in two more recent studies, both of which focus on various sources of stress as motivations for changing community structure and settlement patterns.

Barnett Richling (1993) reconsidered the influence of LIA climate changes and trade. He proposed that short-term variability in the timing of fall freeze-up and spring ice break-up was the origin for economic stress, rather than simple climate cooling, which altered animal biogeography and Inuit hunting patterns. Richling pointed out that ethnohistorical evidence suggests that whale hunting was relatively unpredictable and unproductive (Taylor 1974, 1988). An increased degree of annual variability in ice conditions might account for the inconsistent and apparently low rate of success in whale hunting and, Richling (1993:71) surmised, would also have rendered walrus and harp seal hunting unreliable from year to year. In Richling's view, the failure of traditional means of staple food procurement through whale hunting required the use of two risk-minimization strategies: the pooling of food-sharing networks and the relocation of winter settlements to inner-bay environments where secondary resources (esp. caribou) were available (Richling 1993:71, 74). As well, Richling emphasized reciprocal within-household sharing relationships as a means of facilitating the distribution of trade goods without their direct appropriation as the property of would-be aggrandizers. Communal residence patterns and the communitarian ethic they might enforce would have helped defuse stresses over unequal access to goods when trade opportunities and trade goods remained rare.

More recently, Kaplan and Woollett (2000) suggested that the use of communal houses, at least in the later 18th century, might also have been related to social stresses resulting from economic success and the expression of social resistance against increasing European presence in Labrador. Arguing that the subsistence and trading activities of the 18th century brought a new level of economic prosperity, the authors also noted that this success resulted in unforeseen social problems through social conflicts over, for example, shared surpluses gained from whale hunts, increasingly competitive access to wives brought by widespread polygyny, displays of wealth, and resentments harbored toward self-interested would-be aggrandizers. Lacking effective modes of generalized leadership or means of institutionalized dispute resolution, these stresses

were a certain problem and did lead to feuds and other strife (Taylor 1974, 1979).

The growing influence of Europeans, including missionaries in the later 18th century, arguably deepened these stresses by accelerating the material goods economy, weakening the role of shamans, and breaking down aid and sharing networks. The continued preference for the living arrangements of the communal house in the later 18th century is seen as part of a general societal display of symbols coding conservative values of "Inuitness" (including economic success, wealth, hunting prowess, and cohesion), while the everyday reality of Inuit life was changing with a quickening pace. In this context of unease and change, the communal house might provide a venue for cementing alliances and achieving social cohesion through the extension of preexisting modes of leadership.

RESEARCH QUESTIONS

In this article, I intended to provide information needed to evaluate the hypotheses reviewed above. As observed by Richling (1993:75), all the hypotheses advanced have merits but have lacked confirmation with suitable data. Nevertheless, all revolve around basic economic and, to a lesser degree, environmental presuppositions. The environmental hypothesis proposed by Schledermann presupposes increased sea-ice severity during the LIA and the concomitant abandonment of bowhead whale hunting in favor of seal species (such as ringed seals) that are more readily landed on and around sea ice, although not without economic shortfalls. Richling's version of the economic stress hypothesis presupposes short-term climatic and sea-ice variability, the cessation of effective whale hunting, and with impeded harp seal and walrus hunting during periods of heavy sea ice. He also proposed that caribou and other terrestrial resources gained importance as secondary resources.

The socioeconomic-aggrandizer hypotheses presuppose the maintenance of whale hunting and its attendant ritual behavior into the 18th century. As well, following the expectations of the models of aggrandizer social action of aggrandizers (Hayden 1995), a measure of economic prosperity is also implied by the capacity to generate surpluses for trade and the diversion of surplus labor and resources needed to fund the procurement and processing of these goods, as well as the umiat and dog teams needed to transport them. Productive and predictable subsistence economies might also be indicated by the presence of concentrated populations when, in conditions of scarcity, dispersion of populations might present a means of reducing risk.

The economic and environmental implications of the hypotheses reviewed here will be examined in the rest of the article by addressing four questions: (1) Was the time period associated with the adoption of communal houses and settlement pattern changes associated with increased sea ice or unpredictability?; (2) Were trends in sea-ice severity followed by shifts in seal-hunting patterns indicative of

specialized hunting of ice-adapted species?; (3) Is there evidence for maintained whale hunting in the 18th century?; and (4) Is there archaeological evidence of economic hardship, in terms of seasonal shortfalls and exploitation of secondary species? The first question will be addressed with a review of current paleoenvironmental data concerning climate trends and sea-ice data in the Labrador region. The subsequent economic questions will be then be addressed with two zooarchaeological case studies. The first zooarchaeological study of several sites in the Hamilton Inlet regions will examine long-term trends in subsistence associated with sea-ice conditions, which will, in turn, provide an interpretive context for turn a second zooarchaeological study of subsistence practices employed over a shorter time at Uivak Point, a site associated with whale hunting.

ENVIRONMENTAL HISTORY, PALEOCLIMATE, AND SEA-ICE RECORDS

The first element of this study's analysis is concerned with environmental and paleoclimatic contexts of cultural developments in Labrador of the 17th to 19th centuries. The Labrador Peninsula (see Figure 1) is the northeastern-most extension of the North American continental landmass and represents a zone of transition between arctic and subarctic climate regimes and ecological zones; the manifestation of this transition in phenomena such as the limit of continuous permafrost and the tree line fluctuates in relation to climatic conditions. Although arctic terrestrial ecosystems dominated by tundra and heath are limited to only the northern third of Labrador, the importance of arctic influences are perhaps most evident in the marine environment, which is bound in land-fast ice for six to seven months a year. In protected coastlines sheltered by island clusters, fast ice may extend approximately 40–50 kilometers offshore, representing a range of 80 to 250 kilometers of total fast-ice accumulation—from the innermost reaches of the deepest fjord systems to the maximum seaward edge. The fast-ice ecosystem is associated with particular animals that can subsist under the ice through the winter, most notably the ringed seal (see Smith et al. 1991). For humans and for some carnivores, fast-ice environments serve as important hunting grounds and as travel routes along the coastline and between islands.

Although ringed seals are widely distributed in low concentrations in fast-ice environments, higher concentrations of seals and birds may be found at the margins of land-fast ice associated with polynyas and at the sina. These areas act as winter season refugia for those species, such as harbor seals, that cannot inhabit environments with complete ice cover or that exploit the mixed ecosystems of these ecotone areas as feeding grounds, such as bearded seals and walrus (Stirling 1997). The annual bimodal character of the Labrador's marine environment encourages migratory behavior amongst its fauna. The most common and economically important mammal is the harp seal, which migrates north along the outer coast as sea ice begins to break up and

south again in the fall to early winter, when it lingers in the inner coastal zone prior to the formation of fast ice.

The marine environment is highly sensitive to climatic variability. Sea formation and clearance dates, and sea-ice thickness, extent, and stability all respond positively to reduced temperature and strengthened northerly winds. The location of the sina and the presence and location of polynyas also varies in relation to climate. In general the sina lies further offshore and is more stable in conditions of consistent cold accompanied by thicker ice accumulation. Similarly, coastal polynyas may contract or freeze over in heavy ice conditions, whereas others may result in marginal ice areas with strong currents further offshore (Stirling et al. 1981; Wadhams 2000). Such changes in sea-ice characteristics force accompanying shifts in the territories used by animals, especially seals, which are associated with specific ice conditions (Smith et al. 1991; Stirling 1981, 1997). Insofar as heavier ice conditions expand breeding and feeding territories, ringed seals prosper during colder conditions. Conversely, nonmigratory harbor seals are pushed out of territory as fast ice expands and their range increases in years with lighter ice accumulation. The dates of ice formation and clearance also influence the timing and location of sea-mammal migrations (Sergeant 1991).

Proxy Paleoclimate Records

Recent paleoclimate studies, derived from such data sources as oxygen isotopes in glacial ice cores and tree-ring growth series, provide high-resolution proxy records of climate change sensitive to global-, hemispherical-, and regional-scale variability. Hemispherical climate trends for years between C.E. 1300 and C.E. 1990, derived from decadal mean oxygen isotope concentrations in the Greenland Ice Sheet (Johnsen et al. 1997) as shown in Figure 2, demonstrate a high degree of climatic variability throughout the last six centuries. Episodes with extended periods warmer than the mean are noted from the late 15th until the mid-16th century. The onset of the LIA is conventionally recognized with the onset of a trend of colder mean temperatures by the late 16th century accompanied notably by increased frequency of interannual climatic variability. This cooling trend persisted until the later 19th century, with maximum cold episodes at circa 1630, 1690, and 1760. Nevertheless, the graph also points out the presence of multiple episodes of extended warming through the 18th century, with maxima around 1750 and 1790–1815. Also of note is that these warmer episodes appear to be associated with reduced interdecadal climatic variability, producing a smoother graph for that period. Similar patterns have been also observed in the Greenland Ice Sheet Project 2 (GISP2) ice-core climate record (Mayewski et al. 1994; Meese et al. 1994, see also Ogilvie and Jónsson 2001).

Recent dendroclimatological studies (Briffa et al. 2001; D'Arrigo et al. 1996; Overpeck et al. 1997), drawing on observations from across the circumpolar and circum-boreal regions including coastal Labrador, also document a

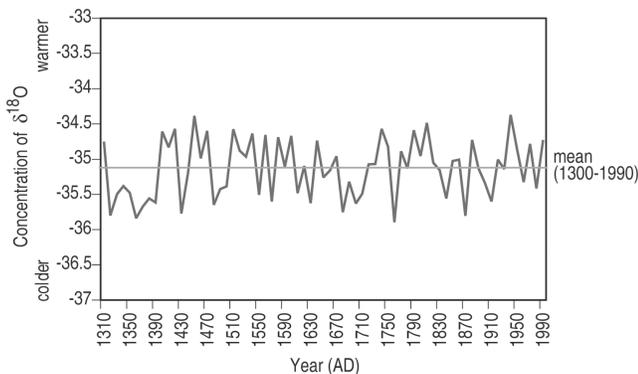


FIGURE 2. Greenland Ice Sheet Project (GRIP) oxygen isotope proxy climate record ($\delta^{18}\text{O}$) 1310–1990. Decadal means of $\delta^{18}\text{O}$ isotope concentrations of snowfall represented in the GRIP ice core, located at the center of the Greenland Ice Sheet, demonstrate onset of LIA climate instability and cooling circa 1400 until the late 19th century. The mid–18th century comprises the warmest years of the LIA. Data from Dansgaard et al. 1993 and Johnsen et al. 1997, provided by the National Snow and Ice Data Center, University of Colorado at Boulder, and the WDC–A for Paleoclimatology, National Geophysical Data Center, Boulder, Colorado.

trend of temperature moderation lasting without serious interruption from the early 18th century until after 1800. Their temperature reconstruction suggests a rapid temperature decline in the early 19th century with an accompanying increase in interannual variability. Maximum cold conditions for the study period were reached by 1840, after which generalized arctic temperatures rose more or less consistently until the late 20th century. The redundancy with which this apparent phase of moderate temperature has been documented in ice-core and dendroclimatological studies suggests that it was a widespread phenomenon in the northwest North Atlantic–eastern Arctic region and the LIA should not be considered a period of uniform cooling (Ogilvie and Jónsson 2001).

Sea-Ice Records

The relationship between climate change and past sea-ice conditions pertinent to the Labrador region has been examined through a number of ice-core and archival studies, two of which are presented in Figure 3. The wind-transported sodium content of ice cores from the Penny Ice Cap on Baffin Island (hereafter, PIC) illustrated in Figure 3.1 provide a proxy for sea-ice cover (esp. that of late winter to spring) in Baffin Bay (Grumet 1997; Grumet et al. 2001), which shows a clear transition to icier conditions in the 16th century, contemporaneous with the onset of colder and more variable climate conditions demonstrated by the GRIP, GISP2, and dendroclimatological records discussed above. Although the PIC record shows considerable variability throughout, there were also phases of reduced ice conditions in the 18th century (esp. the later 18th century) coincident with the trend of moderated climate seen in the ice-core and tree-ring temperature records. A return to heavier ice conditions occurred after 1800.

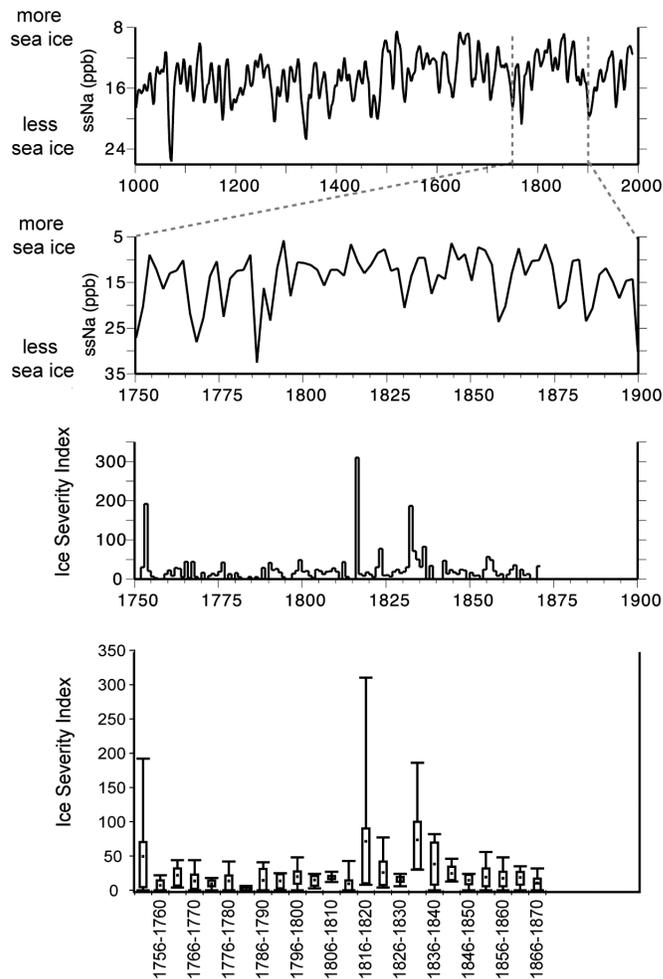


FIGURE 3. Glaciochemical and archival proxy sea-ice records pertinent to the Labrador Sea. Figure 3.1 presents the sea-salt sodium record of the Penny Ice Cap ice core (data from Grumet 1997, images based on Grumet et al. 2001). Figure 3.2 presents an ordinal sea-ice severity index based on archival records (data from Teillet 1988, image based on Woollett et al. 2000). Figure 3.3 presents statistical measures of distribution and dispersion of Teillet's sea-ice severity index as compiled in five-year means (graph based on Woollett 1999).

Because of linkages through currents and winds, the PIC Baffin Bay sea-ice record provides a useful long proxy for winter fast-ice formation and late winter to spring pack-ice severity in the Labrador Sea. An historical sea-ice study conducted by John Teillet (1988) is presented in Figure 3.2. Teillet used Hudson's Bay Company navigational logs and other records to provide a second measure of sea-ice severity around the Labrador Coast, one that is again most sensitive to spring and summer pack-ice conditions. Teillet's constructed an ordinal index of sea-ice severity for years between 1750 and 1870, ranking ice severity of individual years relative to most severe recorded conditions. The distribution of the mildest and most severe ice years demonstrated in Teillet's study corresponds with those of the PIC sodium record, with the mid- to late 18th century and earliest 19th century having relatively few years with severe sea

ice, and the arrival of episodes of severe sea ice in 1816 and again the 1830s. A statistical examination of Teillet's ordinal data is presented in a box-and-whisker plot at the bottom of Figure 3.3, showing the minima, maxima, means, and standard deviations of annual rankings for each five-year period in Teillet's sample. Aside from the 1751–55 period (driven by a single very severe ice year), the 18th century appears to have comprised some of the least variable and mild sea-ice years between 1750 and 1900. Between 1815–16 the most severe ice years in the sample were experienced; notably, during this time, there were also much higher degrees of interannual variability.

The paleoclimatic and sea-ice studies reported here provide the high resolution needed to interpret the character of environmental change in Labrador, and the impacts of these changes on ecosystems and subsistence economies. These subjects will now be examined through archaeological case studies.

HAMILTON INLET: LANDSCAPE HISTORY OVER THE LONG TERM

Zooarchaeological analyses at five winter settlement sites are used in this study to examine the relationships between environmental and ecological change and subsistence economies. These sites are located in locality of Eskimo Island, amidst the Narrows, a constricted strait separating Lake Melville from Groswater Bay, in central Labrador (see Figure 4). The sites were winter sod house settlements that were excavated from 1972 to 1975 by Richard Jordan (1974, 1977) to understand Inuit expansion into the region and the importance of culture contacts with Europeans. Through analyses of artifacts recovered during these excavations, the occupation of Eskimo Island 3 was dated to the 17th century, Eskimo Island 1 and Double Mer Point to the 18th century, Eskimo Island 2 to sometime between the late 18th century to the mid-19th century, and Snooks Cove to the mid- to late 19th century (Kaplan 1983). Of these, Eskimo Island 1 and Double Mer Point consist of communal houses.

A number of ecological and social factors likely encouraged the selection of this place for a settlement. Access to European trading posts south of Hamilton Inlet and to opportunistic “floating trade” with ships was likely one important incentive (Jordan 1974; Kaplan 1983). The ecological characteristics of the Eskimo Island locality certainly present another significant invitation for Inuit settlement. The Narrows generally remains ice free in winter, while the fjord to the west is covered in fast ice and the bay to the east is frequently clogged with pack ice. The mix of ice and open water provides habitats for all sorts of seals close to Eskimo Island, as well as ready access to a variety of travel routes, making it an ideal overwintering location with a range of readily exploited local resources. Periodically, however, the Narrows strait is closed off by exceptional fast-ice development during very cold weather or especially heavy pack ice

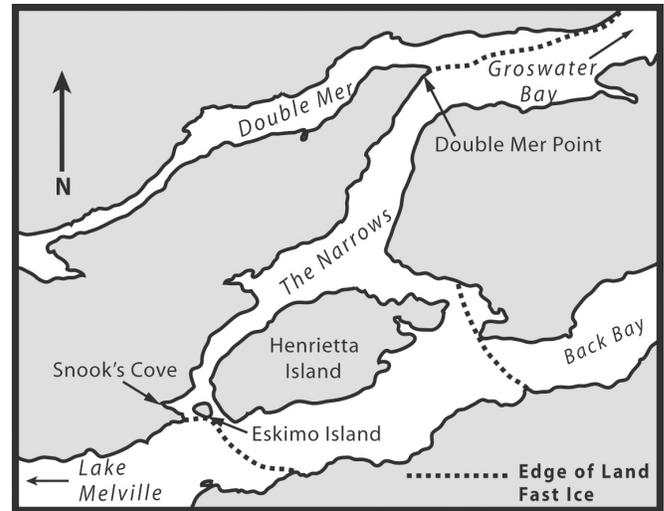


FIGURE 4. Map of the Narrows region of Hamilton Inlet, Labrador, showing distribution of the ice edge and locations of archaeological sites.

condition. During these times, seal habitats and Inuit hunting territories are more widely separated.

Earlier, I conducted and published a complete analysis of the faunal remains from these sites (Woollett 1999, 2003). A brief summary of the faunal collections of these sites is presented in Table 1, with taxonomic abundance of different taxonomic groups expressed as Relative Frequency statistics, the numbers of bones identified corrected for their frequency in whole skeletons. As observed at almost all Inuit winter sites in Labrador, seals comprise by the clear majority of these assemblages, usually over 90 percent of the whole. The overwhelming dominance of seal bones in all of these assemblages strongly suggests that seals were the economic mainstay of Inuit communities in the Narrows region from the 17th to the 19th century. Large sea mammals (walrus and whales) are, however, present in trace quantities, just as are mollusks, birds, and fish. Land mammals (such as caribou, hares, and furbearers) are also poorly represented. Recovery methods likely account for part of the underrepresentation of fish, birds, and small mammals, nevertheless, the skewed character of these species distributions and their uniformity over time suggests relatively direct use of land animals was made in winter in all periods. The land mammals most commonly represented are foxes and dogs, which were used primarily for fur and traction rather than food (Brice-Bennett 1977; Williamson 1997).

Although the whole faunal assemblage of the Narrows sites suggests economic uniformity, some significant differences are implied by comparisons of seal species distribution in these assemblages. The percent frequency of seal bones identified to species (based exclusively on reliably identified crania, maxillae, mandibles, and humeri) are also presented in Table 1. Harp seals were the most important seal species in all but one site. A total of 70 percent these animals were hunted in the fall, while the rest were landed in spring, as indicated by analysis of growth rings

TABLE 1. Zooarchaeological Measures of Abundance of Taxonomic Groups in Archaeological Sites in the Narrows (% Relative Frequency [RF] and Seal % Number of Identified Specimens [NISP])

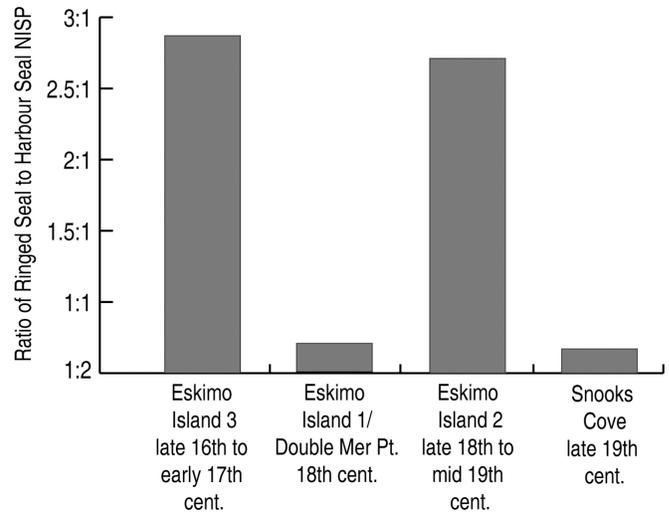
Species	Eskimo Island 3 (late 16th to early 18th century)	Eskimo Island 1/Double Mer Point (18th century)	Eskimo Island 2 (late 18th to mid-19th century)	Snook's Cove (late 19th century)
	% RF	% RF	% RF	% RF
Mollusk	0.9	0.9		
Fish			0.2	
Bird			0.2	
Caribou	1.94	1.8	0.8	11.8
Fur-bearers	1.503	2.4	1.77	0.4
Dog	1.3	1.8	1.5	0.7
Seal	94.5	93.1	95.8	87
Large Sea Mammals	0.004	0.01	0.004	0.4
Total RF	1304.8	961.8	1015.7	121.5
	Seal %NISP	Seal %NISP	Seal %NISP	Seal %NISP
Ringed Seal	30.1	22.5	45.9	27.8
Harbor Seal	10.5	31.9	16.9	41.6
Harp Seal	59.4	45.0	36.1	30.6
Bearded Seal		0.5	1.1	
Total Seal NISP	372	191	183	36

in tooth dentine and cementum (Woollett 2003:518), indicating hunting seasons coinciding with their large-scale migrations.

Ringed seals were generally the second most commonly represented species and were especially common in the late 18th to mid-19th century site of Eskimo Island 2. As demonstrated by analyses of dental and cemental annuli (Woollett 2003:518), ringed seal hunting was focused consistently through time on mature adults supplemented by some young pups, and almost exclusively conducted in winter and spring. Given the association of adults and pups with fast ice and breathing holes, this a pattern of hunting likely associated with the fast-ice areas adjacent to the Narrows.

Harbor seals were, in general, a secondary species, although they were especially common in the 18th century and late 19th century assemblages. Seasonality studies suggest that harbor seals were hunted primarily in fall and spring. As a species primarily associated with open water, harbor seals are present in particular locales of coastal Labrador from late spring to fall to feed and to pup on shore; they spend winter in open water areas beyond the sina (Ames 1977; Boles et al. 1980). Nevertheless, in the 18th-century sites of Eskimo Island 1 and Double Mer Point, the majority of identified harbor seals were actually hunted in winter.

Because of the association of ringed seals and harbor seals with mutually exclusive habitats in winter (ringed seals with fast ice and pack ice at the ice edge, harbor seals with open water), these species may be treated as indicator species aiding the reconstruction of the ecohistory of the Narrows region, specifically of its polynya (Tynan

**FIGURE 5.** Comparison of Ringed Seal and Harbor Seal specimen frequencies in the form of ratios of numbers of identified specimens (NISP) counts presented in Table 1.

and DeMaster 1997; Woollett et al. 2000). The fluctuating frequencies of these species are examined in detail in Figure 5, in the form of ratios of numbers of identified specimens.

A bimodal pattern of species frequency is demonstrated in the graph, with ringed seal specimens outnumbering harbor seal specimens by a factor of over two to one in the 17th and late 18th to mid-19th century assemblages. However, harbor seal remains outnumbered those of ringed seals in the 18th and late 19th century. This pattern might conceivably be an artifact of shifting seasonal patterns of hunting, as ringed seals were more typically landed in winter and spring and harbor seals were more likely landed along with harp seals in fall and spring and during the summer. Nevertheless, all these sites are fall to winter occupations without identified summer components. More importantly, the seasonality of 18th-century harbor seal hunting demonstrated by dental and cemental annuli showed that the majority of these animals were in fact landed in winter. If the archaeological ringed seal-harbor seal ratio reflects past sea-ice conditions, relatively moderate ice conditions with open water in the Narrows and Groswater Bay may be indicated for the 18th and later 19th centuries. This pattern agrees with that demonstrated in Teillet's Labrador Sea ice-severity index. In recent years, open water may at times stretch from the Narrows to the ice edge in Groswater Bay, opening the Narrows to species overwintering at the ice edge, including local harbor seal populations (Ames 1977).

Similarly, the high ratios of ringed seals at the 17th- and early-19th-century sites are consistent with the relatively heavy ice conditions indicated by sea-ice records. More severe ice conditions in the Narrows would have been manifest in more extensive fast ice around Eskimo Island and pack ice enclosing or completely infilling the Narrows, excluding harbor seals living at the ice edge from entering the Narrows. As well, the presence of dense pack ice in the Narrows likely would have hindered the efforts of Inuit to

hunt within the strait itself and encouraged the hunting of mature ringed seals and pups on the fast ice of Lake Melville.

DISCUSSION

The Narrows case poses two basic observations about Labrador Inuit subsistence during the LIA. First, it seems that environmental fluctuations may in fact be reflected in Inuit subsistence practices during the period in which communal houses were adopted. In this case, changing modes of seal hunting appear to be related to the shifting characteristics of a polynya. The employment of communal houses in the Narrows coincided with moderated sea-ice conditions in a presumably more mixed local environment with both open water and fast ice, as well as with a more generalized pattern of seal hunting reflecting more use of open water. The second observation is that relatively little use was made of terrestrial resources, despite in the inland location of the Narrows.

UIVAK POINT 1: A SUBSISTENCE ECONOMY ASSOCIATED WITH WHALE HUNTING

The examination of long-term ecological and subsistence trends in the Narrows provides a framework within which to examine and interpret the subsistence economy of sites occupied over shorter time periods, such as Uivak Point 1. Uivak Point 1 is a substantial winter village in Okak Bay, northern Labrador (see Figure 1), comprising the ruins of nine communal houses. The site was occupied between the mid-18th century and 1807 and was described by Moravian Missionaries, who established a mission post nearby, as one of three settlements engaged in whale hunting in the Okak Bay region (Taylor 1974, 1988; Taylor and Taylor 1977). The site occupies a small cape separating two bays and as such it offers ready access to the fall migration routes of seals and whales that must pass around it and to extensive protected fishing and hunting areas in open water and on the fast ice, as well as providing an unobstructed travel route to offshore islands and the sina in winter and spring, some 20–35 kilometers to the east.

Kaplan and I substantially excavated one communal house (House 7) and its associated midden, and tested other houses and middens between 1993 and 2000 in part to recover substantial faunal assemblages needed to examine subsistence economies associated with whale hunting. As well, an extensive program of geoarchaeological, botanical, and entomological sampling was also undertaken to broaden the scope of land use and pale ecological reconstructions and to support the application of dendrochronological dating methods to the site.

As part of my dissertation research (Woollett 2003), I analyzed and reported on a substantial faunal collection numbering over 95,000 specimens; initial results have also been published in Kaplan and Woollett 2000. The bulk of these specimens were obtained from House 7 and its midden. This discussion will concentrate on two groups of assemblages that may be dated with relative confidence

TABLE 2. Zooarchaeological Measures of Abundance of Taxonomic Groups at Uivak Point 1 (% Relative Frequency [RF] and Seal % Number of Identified Specimens [NISP])

Species	House 7 Midden AU5	House 7 Floor and Midden AU 1,2,3,4
		circa 1740–1785
Mollusk	13.26	2.81
Caribou	1.20	0.99
Fur-bearers	2.50	3.48
Dog	7.11	8.3
Seal	75.48	82.89
Walrus	0.31	0.15
Whale	0.09	1.32
Pig		0.02
Total RF	4424.5	2051.2
	Seal %NISP	Seal %NISP
Ringed Seal	49.44	50.36
Harbor Seal	11.02	6.52
Harp Seal	30.51	28.62
Bearded Seal	9.04	14.49
Total Seal NISP	354	276

(Woollett 2003:413–414). The first, House 7 Midden Analytical Unit 5 (AU5) includes the bulk of the lower portion of the midden. It is dated through its artifact content and stratigraphic association to circa 1740 (at the earliest) to approximately 1785. The second group consists of the preserved House 7 floor deposit and upper midden layers AU 1, 2, 3, and 4. The house and its floor are dated to circa 1785 to 1807 at the latest by dendrochronological dating, artifacts, stratigraphic association, and ethnohistorical records.

A summary of zooarchaeological taxonomic abundance data for categories of major identified species present in these two assemblages is presented in Table 2. Percent relative frequency counts are used to control biases introduced by anatomical differences. Both sets of assemblage groups comprised over 6,000 identified specimens, fish and birds are omitted from this discussion because of poor preservation and their few numbers.

Like those of the Hamilton Inlet sites, these Uivak Point assemblages are clearly dominated by seals, although they show somewhat more species diversity with fur-bearers, dogs, mollusks, and other sea mammals represented. Blue mussels were found in some number; nevertheless, the presence of their shells in dense but limited pockets suggests they were consumed in occasional meals rather than constantly. Despite the overall impression of diversity, caribou remain only a small part of the assemblage. Fur bearers (chiefly arctic fox and red fox) and dogs are more commonly observed than caribou, again suggesting that terrestrial resources were not of tremendous direct importance for the winter coastal economy. Ethnohistorical sources suggest that the Labrador Inuit regularly maintained large dog teams in the 18th century, providing an explanation for their apparent frequency in these assemblages. Two fragments of domesticated pig cranial bones were identified, likely reflecting contact with the Moravian Missionary settlement nearby Uivak Point 1.

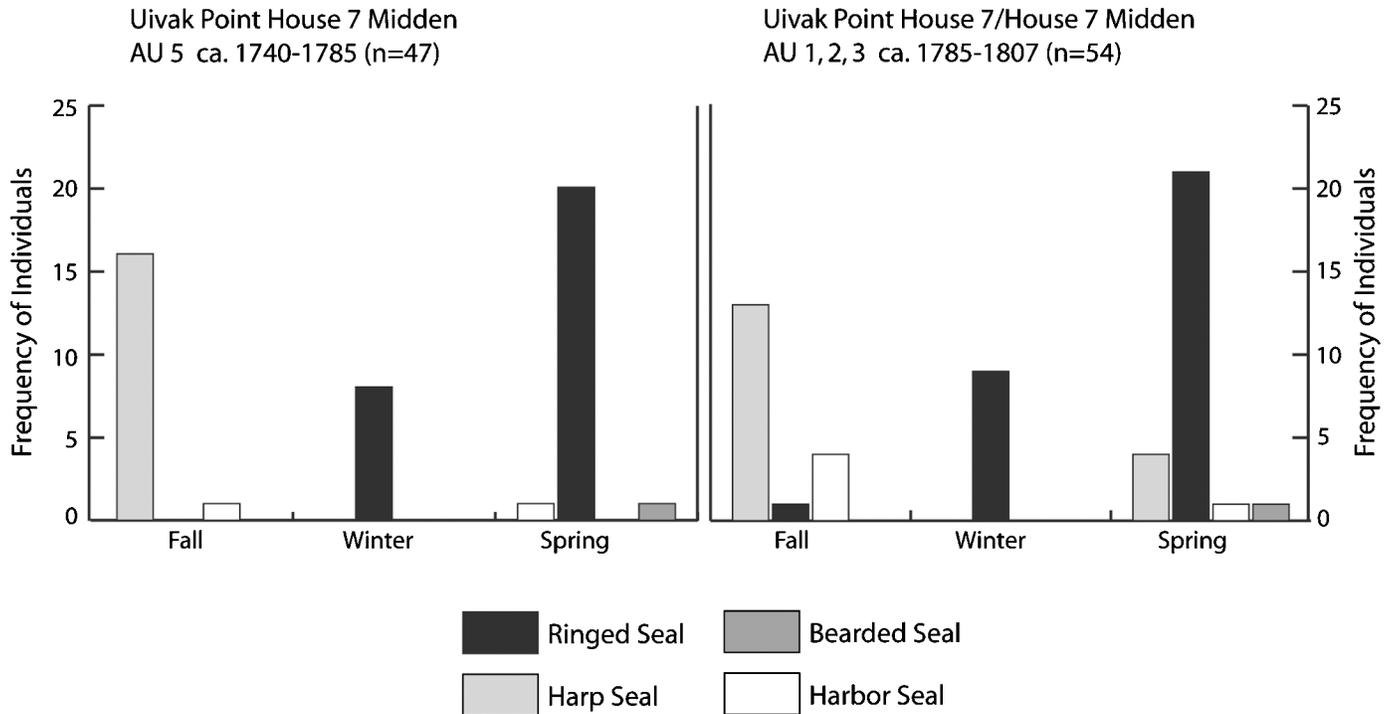


FIGURE 6. Seasonality of seal hunting at Uivak Point 1 based on the mortality of individual by season, as estimated by analysis of dental and cemental annulations.

Whale bones were observed in only small quantities at the site, including 338 bone fragments and 64 whole or large fragments identifiable to element. Many of these large bones of very large mature whales were used as house-building materials and were unlikely to have been derived from hunted animals. Nevertheless, elements such as the caudal vertebra, forelimb, and flippers figure prominently in the assemblage. These elements from meat-rich parts of the whale, are from prized portions normally reserved for boat captains and feasts elsewhere in the arctic and are also not useful as building materials (Savelle 1997; Spencer 1959; Stevenson 1997). Also present are portions such as the pelvic girdle, which are only likely to be present as the waste of whale butchery performed near by the site itself. Juvenile whales, denoted by unfused bones, are more likely to have been the subjects of deliberate hunting (Savelle 1997) and were also present in the assemblage.

The profiles of seal species recovered in the two assemblage groups are remarkably similar through time, especially regarding the major species and the overall diversity of the assemblages. Ringed seals are the most commonly represented seal species, representing nearly half of all identified seal specimens; harp seals comprise just under a third of seal remains. Harbor seals and bearded seals alternate in importance through time, although they are clearly of secondary statistical importance in the assemblage. Bearded seals are large animals that provide both large quantities of meat and thick hide useful for as leather; accordingly, their presence as a relatively common secondary species suggests that they had considerable economic importance.

Further perspective on seal-hunting practices at Uivak Point is gained through estimations of seals' season of death, graphed in Figure 6. In both the earlier and later assemblage groups, the great majority of harp seals were landed during their fall migration, when they arrive in great numbers to feed and pass through coastal waters. Harbor seals were also hunted primarily in the fall. Given that harp seals comprise up to 30 percent of identified seal remains and harbor seals another nine to eleven percent, the fall hunt was evidently one of the most productive hunting periods of the year.

With the exception of a single fall kill, ringed seals were hunted throughout winter and especially in spring, with a very large spring hunt. Age of death determinations based on dental annuli indicated that 41 percent of ringed seals were pups, while another 32 percent were adults. Winter-season hunting probably consisted of a mix of hunting of adult ringed seals at their breathing holes in the fast ice and juveniles overwintering at the sina. Although mid-winter ringed seal hunting does not seem to have been as lucrative as hunting in other seasons, it was plainly capable of replenishing food supplies throughout winter and of alleviating the need to rely on food stored in the fall.

The preponderance of spring kills and these age classes strongly suggests that a second intensive seal hunt was carried on in spring, focused on adults basking on top of the fast ice and on newborn pups near their birthing lairs. Juvenile ringed seals and smaller numbers of harbor,

bearded, and newly arriving harp seals hunted at the sina appear to have supplemented this diverse spring hunting season.

DISCUSSION

Few significant differences were noted between the two groups of assemblages from Uivak Point 1, either in terms of taxonomic abundance or seasonality. Subsistence practices seem, therefore, to have been consistent through the span of occupation of the house considered here (maximally defined as circa 1740 to 1807). Terrestrial mammals, fish, and birds seem to have been, in general, unimportant as subsistence resources, despite sampling routines intended to recover their remains. Archeobotanical studies suggest that plants were heavily exploited, however, for food, fuel, and for furnishing house interiors (Zutter 2006). As with the Hamilton Inlet sites, Inuit hunters living at Uivak Point 1 appear to have, however, focused their efforts on exploitation of marine mammals, which contributed the clear majority of animal remains to domestic refuse deposits. The sea-mammal assemblage shows a generalized pattern of exploitation; all seals and larger sea-mammal species present in the region were exploited to some degree.

The sheer proportion of seal bones in the archaeological assemblages suggests that seals were taken in considerable numbers. The seasonality studies demonstrated that seal-hunting activities continued from fall to spring, as hunters exploited all local species when and where they were available. More than one species or age group of seals was available in each season. The rush of intensive harp-seal hunting in the fall, with perhaps some harbor seals hunted as well, likely produced a surplus of food and other resources that were used immediately or cached. Breathing hole-hunting augmented stored harp seals with a slow but apparently steady supply of adult ringed seals through the winter, with perhaps some subadult ringed seals and bearded seals from the sina. The spring was a second season of very active seal hunting, beginning with basking ringed seals and, at the sina, bearded seals and other species and continuing with harp seals and harbor seals as the ice broke up.

Judging by the various proxy records of sea-ice conditions discussed earlier in this chapter, the time spans represented by these assemblages were dominated by moderated ice conditions. Just as this moderating trend saw a diversification of local ice conditions in Hamilton Inlet and a broadened pattern of seal hunting, it is reasonable to conclude that the broad and apparently prosperous seal hunting economy suggested at Uivak Point is also related to a consistent and mixed local sea-ice environment. For the Okak Bay region, this “mixed” sea-ice environment would have included a long, fall, open-water season or at least no trend to very early ice formation. There would likely have been, as well, ample areas of stable fast ice in sheltered bays and coasts adequate for ringed seal denning and human travel. The location of the sina would have been within

reasonable reach of the coast, and a mix of loose pack ice and formation of flaw-lead polynyas associated with westerly winds may have prevailed at the sina. The variety and balance of such a sea-ice regime would lend itself to a diversification of sea-mammal faunas and a range of economic options from fall to spring.

The faunal analysis provided some evidence for whale hunting in the late 18th century to the opening of the 19th century, in the presence of skeletal elements that are associated with whole carcasses or meat packages but that were not useful as building materials. Some of these elements were associated with prize whale portions that are conventionally considered the shares of the whaling captain or other senior elders in other parts of the Arctic. There was also ample evidence for the use of whale bone for building materials and for use of bones scavenged from very large baleen whales. A prerequisite for whale hunting is the presence of a surplus of food needed to build and maintain boats and other hunting equipment and the ability to feed a community while boat crews divert time to a high-risk economic venture. It is argued here that the fall harp seal hunt was predictable and productive enough to meet these needs.

CONCLUSIONS

The goal of this article was to explore the application of historical ecology approaches to gain new insight on culture-environment dynamics in Labrador’s Contact period. In particular, I have sought in this study to establish links between agent-oriented and ecosystem approaches by exploiting the potential of modern paleoenvironmental records to expose fluctuations of environmental systems in short time periods significant to individual actors (see Brumfiel 1994). Combined with zooarchaeological studies of ecologically sensitive indicator species involving age, seasonality and life-history data, and other environmental archaeology approaches, high-resolution proxy environmental records provide a means to reconstruct the history of particular landscape forms and features important to past peoples and significant to their uses of such landscapes. These landscape histories are integral parts of paleoeconomic reconstructions. Essential to this approach was the adoption of a multidisciplinary research program, the use of large and rich data collections capable of addressing precise research questions and of supporting a temporal segregation of data, and the employment of long-term, short-term, regional, and local analytical perspectives.

By applying these perspectives to the Labrador case studies, I was better able to situate specific, long-debated culture changes in their environmental and economic contexts. Insofar as the present sample of sites is reflective of Labrador in general, the use of the communal house and the accompanying settlement pattern changes do not seem to have coincided with a period of notable cold and increased sea ice, or with more pronounced interannual variability, but, rather, with a string of episodes of climatic moderation,

reduced sea ice, and a degree of climatic stability within the LIA. Despite their relocation of winter settlements closer to the mainland, it does not seem that Labrador Inuit incorporated a substantial use of terrestrial animal, fish, or bird resources into their subsistence economies. Rather, subsistence economies were oriented toward the exploitation of locales with diversified and patchy resources (such as ice-free areas near extensive fast ice), which permitted a generalized use of marine mammals and facilitated transport. Ringed seals were indeed important throughout the period in question, but they were only one of four major seal species exploited when and where they were most plentiful or accessible. Plant resources also seem to have been important. Whale hunting was indeed maintained into the late 18th century, although apparently at modest level. It remains for the moment unclear how this mode of hunting compares to whale hunting practiced by initial Thule settlers in Labrador, or if perhaps whale hunting became more profitable with the arrival of the European market.

Finally, there is no specific reason to conclude on the basis of this study that subsistence economies were particularly vulnerable to shortfalls during the 18th century, while communal houses were in use. The Inuit of Hamilton Inlet and Uivak Point 1 were able to exploit locales with diverse marine and sea-ice environments and to focus their efforts on the most productive animal resources (seals) from fall to spring. As well, they appear to have had the capacity to engage in surplus-producing productive strategies, and they continued to hunt ringed seals in quantity throughout the winter. Significantly, little use was made of potential back-up resources such as caribou, and more than one seal species or seal age class was exploited in each season from fall to spring. In the absence of evidence of scarcity of subsistence resources, future research might profitably examine further the ideas that communal houses facilitated the reinforcement of aid networks, alliances, or reciprocal distribution of scarce material goods as proposed by Richling (1993) and Kaplan and Woollett (2000). Research might as well examine as the physical structure of social space in communal houses to learn more about Inuit social relations during this period.

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NOTES

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REFERENCES CITED

- Ames, R.
1977 Land Use in the Rigolet Region. *In* *Our Footprints Are Everywhere: Inuit Land Use and Occupancy in Labrador*. C. Brice-Bennett, ed. Pp. 279–308. Nain, Newfoundland and Labrador: Labrador Inuit Association.
- Amorosi, T., J. M. Woollett, S. Perdikaris, and T. McGovern
1996 Regional Zooarchaeology and Global Change: Problems and Potentials. *World Archaeology* 28(1):126–157.
- Balée, W.
1999 Introduction. *In* *Advances in Historical Ecology*. W. Balée, ed. Pp. 1–10. New York: Columbia University Press.
- Berkes, F., and C. Folke
1998 Linking Social and Ecological Systems for Resilience and Sustainability. *In* *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. F. Berkes and C. Folke, eds. Pp. 1–26. Cambridge: Cambridge University Press.
- Bird, J.
1945 Archaeology of the Hopedale Area, Labrador. *Anthropological Papers of the American Museum of Natural History*, 39(2). New York: American Museum of Natural History.
- Boles, B., G. J. Chaput, and F. Phillips
1980 Offshore Labrador Biological Studies, 1979: Seals. A Study and Review of the Distribution of Pinnipeds in Labrador. Report by Atlantic Biological Services Ltd, St. John's, Newfoundland. Calgary: Total Eastcan Explorations.
- Braudel, F.
1972 *The Mediterranean in the Age of Phillip II*. S. Matthews, trans. New York: Harper and Row.
- Brice-Bennett, C.
1981 Two Opinions: Inuit and Moravian Missionaries in Labrador. M.A. thesis, Department of Anthropology, Memorial University of Newfoundland.
- Brice-Bennett, C., ed.
1977 *Our Footprints Are Everywhere: Inuit Land Use and Occupancy in Labrador*. Nain, Newfoundland and Labrador: Labrador Inuit Association.
- Briffa, K. R., T. J. Osborn, F. H. Schweingruber, I. C. Harris, P. D. Jones, S. G. Shiyatov, and E. A. Vaganov
2001 Low-Frequency Temperature Variations from a Northern Tree Ring Density Network. *Journal of Geophysical Research* 106(D3):2929–2941.
- Brumfiel, Elizabeth M.
1992 Distinguished Lecture in Archeology: Breaking and Entering the Ecosystem—Class, Gender, and Faction Steal the Show. *American Anthropologist* 94(3):551–567.
- Bryson, R., and W. Wendland
1967 Tentative Climate Patterns for Some Late Glacial and Post-Glacial Episodes in Central North America. *In* *Life, Land, and Water*. W. Meyer-Oakes, ed. Pp. 271–298. Winnipeg: University of Manitoba Press.
- Cartwright, G.
1922 A Journal of Transactions and Events during a Residence of Nearly Sixteen Years on the Coast of Labrador; Containing Many Interesting Particulars, Both of the Country and Its Inhabitants, Not Hitherto Known. 3 vols. Newark: Allin and Ridge.
- Crumley, C. L.
1994 Historical Ecology: A Multidimensional Ecological Orientation. *In* *Historical Ecology: Cultural Knowledge and Changing Landscapes*. C. Crumley, ed. Pp. 1–16. Santa Fe: School of American Research Press.
- 1999 Foreword. *In* *Advances in Historical Ecology*. W. Balée, ed. Pp. ix–xiv. New York: Columbia University Press.

- D'Arrigo, R. D., E. R. Cook, and G. C. Jacoby
1996 Annual to Decadal-Scale Variations in Northwest Atlantic Sector Temperatures Inferred from Labrador Tree Rings. *Canadian Journal of Forestry Research* 26:143–148.
- Dansgaard, W., S. J. Johnson, and H. Clausen
1970 Grønlands Klima—Før, Nu og 50 aar Frem (Greenland's climate in the past, today, and 50 years from now). *Grønland (Greenland)* 6:161–172.
- Dansgaard, W., S. J. Johnsen, H. Clausen, D. Dahl-Jensen, N. Gundestrup, C. Hammer, C. Hvidberg, J. P. Steffensen, A. E. Sveinbjörnsdóttir, J. Jouzel, and G. C. Bond
1993 Evidence for General Instability of Past Climate from a 250 kyr Ice-Core Record. *Nature* 364(July 15): 218–220.
- Environmental Assessment Panel
1999 Report on the Voisey's Bay Mine and Mill Project, March 1999. Government of Canada, Government of Newfoundland and Labrador, Innu Nation, Labrador Inuit Association. Ottawa: Minister of Public Works and Government Service Canada.
- Finlayson, A. C., and B. J. McCay
1998 Crossing the Threshold of Ecosystem Resilience: The Commercial Extinction of the Northern Cod. *In Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. F. Berkes and C. Folke, eds. Pp. 311–338. Cambridge: Cambridge University Press.
- Fitzhugh, W. W.
1994 Staffe Island I and the Northern Labrador Dorset-Thule Succession. *In Threads of Arctic Prehistory: Papers in Honour of William E. Taylor, Jr. D. Morrison and J.-L. Pilon*, eds. Pp. 239–268. Archaeological Survey of Canada Mercury Series Paper, 149. Ottawa: Canadian Museum of Civilization.
- Grumet, N. S.
1997 Glaciochemical Investigations of the Last 1,000 Years from the Penny Ice Cap, Baffin Island. M.Sc. Thesis, Department of Earth Science, University of New Hampshire.
- Grumet, N. S., C. P. Wake, P. A. Mayewski, G. A. Zielinski, S. I. Whitlow, R. M. Koerner, D. A. Fisher, and J. M. Woollett
2001 Variability of Sea-Ice Extent in Baffin Bay over the Last Millennium. *Climatic Change* 49:129–145.
- Gulløv, H.-C.
1997 From Middle Ages to Colonial Times: Archaeological and Ethnohistorical Studies of the Thule Culture in South West Greenland 1300–1800 AD. *Meddelelser om Grønland. Man and Society* 23:1–501.
- Hardesty, D. L., and D. D. Fowler
2001 Archaeology and Environmental Changes. *In New Directions in Archaeology and Environment: Intersections*. C. L. Crumley, ed. Pp. 72–89. Walnut Creek, CA: AltaMira Press.
- Hayden, B.
1995 Pathways to Power: Principles for Creating Socioeconomic Inequalities. *In Foundations of Social Inequality*. T. D. Price and G. M. Feinman, eds. Pp. 15–85. New York: Plenum Press.
- Hickey, C. G.
1984 An Examination of Processes of Cultural Change among Nineteenth Century Copper Inuit. *Études/Inuit/Studies* 8(1):13–35.
- Hiller, J. K.
1968 The Foundation and Early Years of the Moravian Mission of Labrador, 1752–1805. Ph.D. thesis, Department of History, Memorial University of Newfoundland.
- Johnsen, S. J., H. Clausen, W. Dansgaard, N. Gundestrup, C. U. Hammer, K. K. Andersen, C. S. Hvidberg, D. Dahl-Jensen, J. P. Steffensen, H. Shoji, A. E. Sveinbjörnsdóttir, J. White, J. Jouzel, and D. A. Fisher
1997 The $d^{18}O$ Record along the Greenland Ice Core Project Deep Ice Core and the Problem of Possible Eemian Climatic Instability. *Journal of Geophysical Research* 102:26397–26410.
- Jordan, R. H.
1974 Preliminary Report on Investigations of the Labrador Eskimo in Hamilton Inlet in 1973. *Man in the Northeast* 8(1):77–89.
- 1977 Inuit Occupation of the Central Labrador Coast since 1600 AD. *In Our Footprints are Everywhere: Inuit Land Use and Occupancy in Labrador*. C. Brice-Bennett, ed. Pp. 43–48. Nain, Newfoundland and Labrador: Labrador Inuit Association.
- 1978 Archaeological Investigations of the Hamilton Inlet Labrador Eskimo: Social and Economic Responses to Contact. *Arctic Anthropology* 15(2):175–185.
- Jordan, R. H., and S. A. Kaplan
1980 An Archaeological View of the Inuit/European Contact Period in Central Labrador. *Études/Inuit/Studies* 4(1–2):35–45.
- Kaplan, S. A.
1983 Economic and Social Change in Labrador Neo-Eskimo Culture. Ph.D. dissertation, Department of Anthropology, Bryn Mawr College.
- 1985 European Goods and Socio-Economic Change in Early Labrador Inuit society. *In Cultures in Contact: The European Impact on Native Cultural Institutions in Eastern North America, A.D. 1000–1800*. W. Fitzhugh, ed. Pp. 45–70. Washington, DC: Smithsonian Institution Press.
- Kaplan, S. A., and J. M. Woollett
2000 Challenges and Choices: Exploring the Interplay of Climate, History, and Culture on Canada's Labrador Coast. *Arctic, Antarctic, and Alpine Research* 32(3):351–359.
- Maxwell, M. S.
1985 Prehistory of the Eastern Arctic. New York: Academic Press.
- Mayewski, P. A., L. D. Meeker, S. Whitlow, M. S. Twickler, M. C. Morrison, P. Bloomfield, G. C. Bond, R. B. Alley, A. J. Gow, P. M. Grootes, D. A. Meese, M. Ram, K. C. Taylor, and W. Wumkes
1994 Changes in Atmospheric Circulation and Ocean Ice Cover over the North Atlantic during the Last 41,000 Years. *Science* 263(5154): 1747–1751.
- McGhee, R.
1984 The Thule Village at Brooman Point, High Arctic Canada. Archaeological Survey of Canada Mercury Series, 125. Ottawa: National Museum of Man.
- 1994 Disease and the Development of Inuit Culture. *Current Anthropology* 35(5):565–594.
- 1999 Radiocarbon Dating and the Timing of the Thule Migration. *In Identities and Cultural Contacts in the Canadian Arctic*. M. Appelt, J. Berglund, and H. C. Gulløv, eds. Pp. 181–191. Copenhagen: Danish Polar Center.
- Meese, D. A., R. B. Alley, A. J. Gow, P. Grootes, P. A. Mayewski, M. Ram, K. C. Taylor, E. D. Waddington, and G. Zielinski
1994 The Accumulation Record of the GISP2 Core and an Indicator of Climate Change throughout the Holocene. *Science* 266(5191):1680–1682.
- Morrison, D.
1989 Radiocarbon Dating Thule Culture. *Arctic Anthropology* 26(2):48–77.
- Ogilvie, A. E. J., and T. Jónsson
2001 "Little Ice Age" Research: A Perspective from Iceland. *Climatic Change* 48:9–52.
- Oosten, J. G.
1986 "Big-Man" and Ihumatar: Personal Power and Leadership in Melanesia and the Canadian Arctic. *In Private Politics: A Multidisciplinary Approach to "Big-Man" Systems*. *Studies in Human Society*, vol. 1. M. van Bakel, R. Hagesteijn, and P. van de Velde, eds. Pp. 67–75. Leiden, the Netherlands: E. J. Brill.
- Overpeck, J., K. Hughen, D. Hardy, R. Bradley, R. Case, M. Douglas, B. Finney, K. Gajewski, G. C. Jacoby, A. Jennings, S. Lamoureux, A. Lasca, G. MacDonald, J. Moore, M. Retelle, S. Smith, A. Wolfe, and G. A. Zielinski
1997 Arctic Environmental Change of the Last Four Centuries. *Science* 278(5341): 1251–1256.
- Petersen, R.
1974–75 Some Considerations Concerning the Greenland Longhouse. *Folk* 16–17:171–188.
- Richling, B.
1993 Labrador's "Communal House Phase" Reconsidered. *Arctic Anthropology* 30(1):67–78.
- Savelle, J. M.
1997 The Role of Architectural Utility in the Formation of Zooarchaeological Whale Bone Assemblages. *Journal of Archaeological Science* 24:869–885.
- Schledermann, P.
1975 Thule Prehistory of Cumberland Sound, Baffin Island, Canada. Archaeological Survey of Canada Mercury Series Paper, 38. Ottawa: National Museum of Man.

- 1976a The Effect of Climatic/ecological Changes on the Style of Thule Culture Winter Dwellings. *Arctic and Alpine Research* 8 (1):37–47.
- 1976b Thule Culture Communal Houses in Labrador. *Arctic* 29(1):27–37.
- 1996 *Voices in Stone: A Personal Journey into the Arctic Past*. Komatik Series, 5. Calgary: Arctic Institute of North America of the University of Calgary.
- Sergeant, D. E.
1991 Harp Seals, Man and Ice. Canadian Special Publication of Fisheries and Aquatic Sciences, 114. Ottawa: Department of Fisheries and Oceans.
- Smith, T. G., M. O. Hammill, and G. Taugbøl
1991 A Review of the Developmental, Behavioral and Physiological Adaptations of the Ringed Seal, *Phoca hispida*, to Life in the Arctic. *Arctic* 44(2):124–131.
- Spencer, R. F.
1959 The North Alaskan Eskimo: A Study in Ecology and Society. Smithsonian Institution Bureau of American Ethnology Bulletin, 171. Washington, DC: Smithsonian Institution Press.
- Spieß, A.
1978 Zooarchaeological Evidence Bearing on the Nain Area Middle Dorset Subsistence-settlement Cycle. *Arctic Anthropology* 15:48–60.
- Stevenson, M. G.
1997 Inuit, Whalers and Cultural Persistence: Structure in Cumberland Sound and Central Inuit Social Organization. Oxford: Oxford University Press.
- Stirling, I.
1981 Introduction. In *Polynyas in the Canadian Arctic*. I. Stirling and H. Cleator, eds. Pp. 5–6. Occasional Paper, 45. Ottawa: Canadian Wildlife Service. Environment Canada.
- 1997 The Importance of Polynyas, Ice Edges and Leads to Marine Mammals and Birds. *Journal of Marine Systems* 10:9–21.
- Stirling, I., H. Cleator, and T. G. Smith
1981 Marine Mammals. In *Polynyas in the Canadian Arctic*. I. Stirling and H. Cleator, eds. Pp. 5–49. Occasional Paper, 45. Ottawa: Canadian Wildlife Service.
- Taylor, J. G.
1974 Labrador Eskimo Settlements of the Early Contact Period. National Museum of Man Publications in Ethnology, 9. Ottawa: National Museums of Canada.
- 1979 Tuglavina. In *Dictionary of Canadian Biography*, vol. 4: 1771–1800. F. G. Halpenny, ed. Pp. 740. Toronto: University of Toronto Press.
- 1988 Labrador Inuit Whale Use in the Early Contact Period. *Arctic Anthropology* 25(1):120–130.
- Taylor, J. G., and H. Taylor
1977 Inuit Land Use and Occupancy in the Okak Region, 1776–1830. In *Our Footprints Are Everywhere: Inuit Land Use and Occupancy in Labrador*. C. Brice-Bennett, ed. Pp. 59–81. Nain, Newfoundland and Labrador: Labrador Inuit Association.
- Teillet, J. V.
1988 A Reconstruction of Summer Sea Ice Conditions in the Labrador Sea Using Hudson's Bay Company Ship's Log-Books, 1751 to 1870. M.A. thesis, Department of Geography, University of Manitoba.
- Tynan, C. T., and D. P. DeMaster
1997 Observations and Predictions of Arctic Climate Change: Potential Effects on Marine Mammals. *Arctic* 50(4):308–322.
- Vibe, C.
1967 Arctic Animals in Relation to Climate Fluctuations. *Meddelelser om Grønland* 170(5). Copenhagen: The Commission for Polar Research in Greenland.
- Wadhams, P.
2000 *Ice in the Ocean*. Amsterdam: Gordon and Breach Science Publishers.
- Weyer, E.
1962 *The Eskimos, Their Environment and Folkways*. New Haven, CT: Archon Books.
- Whitridge, Peter
1999 The Construction of Social Difference in a Prehistoric Inuit Whaling Community. Ph.D. dissertation, Department of Anthropology, University of Arizona.
- Williamson, A. H.
1997 From Sina to Sikujâluk: Our Footprint. Mapping Inuit Environmental Knowledge in the Nain District of Northern Labrador. Nain, Newfoundland and Labrador: Labrador Inuit Association.
- Woollett, J. M.
1999 Living in the Narrows: Subsistence Economy and Culture Change in Labrador Inuit Society during the Contact Period. *World Archaeology* 30(3):370–387.
- 2003 An Historical Ecology of Labrador Inuit Culture Change. Ph.D. dissertation, Department of Anthropology, The Graduate Center, City University of New York.
- Woollett, J. M., A. S. Henshaw, and C. P. Wake
2000 Palaeoecological Implications of Archaeological Seal Bone Assemblages: Case Studies from Labrador and Baffin Island. *Arctic* 53(4):395–413.
- Zutter, C.
2006 Palaeoethnobotanical Research in Northern Labrador/Archeobotanical Investigations. Paper presented to the View From Here: History and Ecology of the North Atlantic Region Conference, Québec, September 20–24.