Bad Year Economics at Birchy Lake

DONALD H. HOLLY JR., *Department of Sociology, Anthropology, and Criminology, Eastern Illinois University, Charleston, IL 61920 USA, and Department of Archaeology, Memorial University of Newfoundland and Labrador, St. John's, NL. Email: dhholly@eiu.edu*
PAUL PRINCE, *Department of Anthropology, MacEwan University, Edmonton, AB T5J 2P2, Canada*
JOHN C. ERWIN, *Provincial Archaeology Office, Government of Newfoundland and Labrador, St. John's, NL A1B 4J6, Canada*

Anthropologists have long been interested in understanding how societies cope with risk and uncertainty in their subsistence economies. The topic has been of particular interest to the study of hunters and gatherers, where risk and uncertainty are often conceptualized as problems of the natural rather than social environment. This paper focuses on an archaeological site located in the interior of the island of Newfoundland that was inhabited by Amerindian people hunting caribou in the spring of the year, presumably because they were having difficulty procuring marine resources at the coast. The plight of these Amerindians, at a time when they were sharing the island with Paleo-Inuit peoples and climate change was undermining islanders' access to critical marine resources, highlights the complex play between cultural adaptation, social and historical processes, and the natural environment.

Key words: risk management, hunter-gatherers, Arctic and Subarctic, grease rendering, subsistence stress, history and tradition

BAD YEAR ECONOMICS REVISITED

The title of this article is borrowed from John Halstead and John O'Shea's (1989a) influential edited volume, *Bad Year Economics: Cultural Responses to Risk and Uncertainty*. The book famously explores the ways that different societies attempt to cope with uncertainty and risk in their environment, particularly as both impact subsistence economies. In this context, the bad year to which the editors allude in the title refers to times (not necessarily a year in duration) during which people faced—and sought to overcome—subsistence stress. According to the editors, such bad times could be weathered by increasing mobility, diversifying the diet, and storing food physically and socially (in the form of banking obligations).

In their introduction to the volume, the editors are careful to conceptualize the environment as encompassing physical, biological, and social dimensions, and to suggest

Submitted January 16, 2017; accepted May 9, 2017; published online April 19, 2018.
Journal of Anthropological Research (Summer 2018). 0091-7710/2018/7402-0004$10.00

that risk mitigating and buffering solutions develop from human experience and interactions with each (Halstead and O'Shea 1989b). Most of the contributions that follow their introduction, however, largely frame the natural environment as the prime challenge that humans must overcome. This approach will be familiar to anyone who studies hunters and gatherers, especially those who inhabit marginal environments (cf. Cannon 2011; Holly 2002a; Hood 1998; Lourandos 1997; Lupo et al. 2014; Morrison 2002; Rival 2002; Sassaman and Holly 2011; Warren 2005).

Taking a page from the introduction to *Bad Year Economics*, we aim to interpret the efforts of one small group of hunter-gatherers to cope with resource stress in a way that takes into account challenges posed by the natural environment, but also broader social and historical processes. Our paper focuses on a small, springtime caribou hunting camp that was located on the shores of Birchy Lake, in the interior of the island of Newfoundland, Canada. The site was occupied sometime during the eighth or ninth century AD by Amerindian peoples associated with the Beaches Complex. This was a socially and environmentally dynamic period of time on the island. The latter half of the first millennium AD saw warming temperatures associated with the Medieval Climatic Anomaly (e.g., Levac 2003:fig. 6; Rosenberg et al. 2005; Solignac et al. 2004) reduce sea ice, and with it, hunters' access to harp seal herds (Bell and Renouf 2008). It was also a time in which two very different groups of hunters and gatherers lived on the island: the Dorset, a Paleo-Inuit people, and Amerindians of the so-called Recent Indian tradition.[1] The Dorset's tenure would end shortly. By the tenth century they vanish from the archaeological record—the result of their either retreating north to Labrador or failed efforts to stay put (Holly 2011)—while Amerindians would remain on the island to meet the Norse, and centuries later, migratory European fishermen, at which time they were known as the Beothuk.

LAND & SEA: ENVIRONMENTAL CHALLENGES AND OPPORTUNITIES

Everyone who has ever lived on the island of Newfoundland has relied on the sea for their livelihood. This was true of the first people to settle the island during the Archaic period (3000–1500 BC), of later waves of Paleo-Inuit (1000 BC to AD 900) and Amerindian peoples (starting around 1 AD), and of more recent European fishermen and settlers (since AD 1500).

Dependence on the sea is understandable given the island's rich and varied marine resources. Several different kinds of seals make Newfoundland's waters home for at least part of the year, including harbor, grey, hooded, bearded, and harp seal (Mansfield 1964; Sergeant 1991). Harp seals, especially, were a favorite target of hunters when they migrated past the island each winter and spring (Renouf 1993, 2011). Migratory and resident seabirds, representing dozens of species and numbering in the tens of millions, also played a significant role in the diet of native peoples (Kristensen 2011; Montevecchi and Tuck 1987). Of probably some importance was the now-extinct great auk (see Kristensen 2011:307), a large flightless bird that had at least one major

colony on the coast of the island (Gaston and Jones 1998:122; Montevecchi and Tuck 1987:147). Fish were also plentiful. Indeed, until recently the island boasted one of the richest cod fishing grounds on the planet. Poor preservation and past recovery techniques make it difficult to fully assess the contribution of fish to the diet of native peoples, but it seems that cod, capelin, smelt, sculpin, and especially salmon were harvested (Cridland 1998; Cumbaa 1984; Hodgetts et al. 2003; Schwarz 1992). Whales were also seasonally available, but there is little evidence that they were hunted; if any were, it was probably only the small northern pilot whale, which travel together in pods and can be driven into shallow waters by the coordinated efforts of boatmen working close to shore (Templeman 1966:142). Walrus, a rare visitor to the island today, were more common in the region in the past and may have been taken occasionally (Lewis and Doutt 1942; Pintal 1989:39; Spiess 1992:168).

The island's terrestrial environment offers fewer and less-abundant food options (Tuck and Pastore 1985). Only fourteen terrestrial mammals were present on the island in antiquity: two species of bat, a meadow mouse, weasel, pine marten, the red fox, lynx, muskrat, river otter, a now-extinct wolf, Arctic hare, black bear, caribou, and beaver (Bergerud 1983:130; Dodds 1983). With the exception of caribou, which dominate interior faunal assemblages, and beaver, which is often present as well (Gilbert 2002; Reader 1998; Rowley-Conwy 1990; Stewart 1971, 1973), few other terrestrial mammals contributed significantly to the diet of native people. There is little variety of freshwater fish on the island (Cameron 1958:113; Scott and Crossman 1973), but anadromous salmon appear to have been an important food resource for at least some native groups (Barnable 2008; Marshall 1996; Schwarz 1992:20–22, 27, 1994:62). Ptarmigan and waterfowl are also available inland.

Typical of northern environments, most of Newfoundland's food resources are only seasonally abundant. Harp seals, for instance, are available to hunters in the millions but only in midwinter and early spring as they migrate south, and then later north, past the island. Caribou, although present year-round, are most easily targeted in the fall and spring when they gather to migrate. The later spring and summer months offered hunters perhaps the greatest variety of food options, including seabirds, inshore fish, salmon, and harbor seals. But with the exception of late spring and summer, which allowed for more flexibility in subsistence pursuits—and in turn greater forgiveness when said pursuits turned out poorly—being at the right place and time was critical to hunting success on the island.

The importance of coastal resources for island peoples is archaeologically evident in settlement patterns and in the faunal record, both of which suggest a broad coastal orientation for Maritime Archaic, Paleo-Inuit, and later Amerindians (Bell and Renouf 2003; Cridland 1998; Holly 2002b, 2008; Renouf 1993; Schwarz 1994; Spiess 1992). The exception are the Beothuk, the descendants of Amerindian peoples who arrived on the island at the dawn of the first millennium AD. When the Beothuk were encountered by European fishermen in the early sixteenth century they were living primarily on the coast (Holly 2008; Holly et al. 2015; Pastore 1989:53). However, in-

creased European fishing activity, settlement, and competition over critical resources such as salmon eventually forced the Beothuk inland in the latter half of the eighteenth century. In part to make up for diminished access to coastal resources, the Beothuk intensified their pursuit and processing of caribou (Holly 1998, 2000, 2008; Pastore 1989:66–67). Harassment by settlers and fishermen continued, however, and disease may have taken a toll too (Marshall 1981). But even without these problems it is unlikely that the specialized, interior-oriented economy that the Beothuk had developed in the eighteenth century would have been sustainable given the Beothuk's diminished access to the sea. By the early nineteenth century the Beothuk population had collapsed to the point that survivors probably sought refuge in Labrador or folded into the ranks of their Mi'kmaq neighbors on the island. Shanawdithit, a Beothuk woman often considered the last of her people, died in St. John's in 1829 (see Marshall 1996).

The demise of the Beothuk is testament to the importance of coastal resources for island living. At the same time, the archaeological record tells us that a range of adaptations or lifeways were possible. Thus, although the coast was clearly utilized by all, not all relied on marine and terrestrial resources to the same extent. The Dorset, for instance, were the island's most maritime-specialized people, spending much of the year on the coast harvesting seals, especially harp seals (Hodgetts 2005; Murray 2011; Renouf 1993, 2011). In contrast, the Amerindian ancestors of the Beothuk practiced a more generalized subsistence strategy that targeted a wider range of marine resources and seabirds and included an important terrestrial component (Cridland 1998; Holly et al. 2015; Kristensen 2011; Schwarz 1994).

Cultural processes, such as adherence to tradition and peoples' responses to unfolding social phenomena, likely contributed to the constitution of these different lifeways. The basic contours of Paleo-Inuit and Amerindian subsistence economies, for instance, appear to have been forged prior to the arrival of these groups on the island: for the Paleo-Inuit, on Arctic coasts far north of Newfoundland, and for Amerindians, in the boreal forests and adjacent shores of the Northeast and Eastern Subarctic (see Holly 2013; Milne and Park 2016; Ryan 2016). Thus, newly arrived immigrants did not engage with the resource environment as it simply was, but rather in the ways that it appeared to them, and for reasons that resonated with traditional sociocultural practices (Holly 2013). Unfolding social and historical processes also informed subsistence and settlement practices. They certainly did for the Beothuk, whom we might imagine would have never left the coast had it not been for the growing and hostile presence of Europeans there.

We suspect that similar processes played a critical role in informing the lifeways of the Beothuk's ancestors on the island a millennium earlier, when they were then "sharing" it with the Dorset. This paper focuses on the end of this era—the period between AD 700 and 900, when the Dorset's tenure on the island was coming to a close. Our research addresses this critical period from the perspective of an Amerindian campsite located on the shores of Birchy Lake, in the northeastern interior of the island of Newfoundland, where it appears that people were struggling to find food in the spring. We

suggest that the Amerindian presence at Birchy Lake highlights how the entanglement of tradition, social process, and environmental conditions shaped the course of the island's history and the fate of the people who lived there, and more broadly, how it underscores the complex play between people's cultural adaptations and their natural and social environment.

BIRCHY LAKE, NEWFOUNDLAND

Birchy Lake is located 25 km inland from the coast at the base of the Baie Verte Peninsula in northeastern Newfoundland (Figure 1). It is a long and narrow lake that stretches 20 km northeast to southwest and averages less than a kilometer in width. As one of a series of waterways that link northeastern Newfoundland to the island's west coast, it probably served as an important travel route for native peoples in the region. Its location and narrow width also made it an ideal place to intercept migrating herds of caribou crossing the lake in the fall and spring.

Archaeological reconnaissance of Birchy Lake includes a number of spot-specific investigations (Jacques Whitford Ltd. 1991; Reynolds 2002; Schwarz 2011), mostly for the purpose of environmental impact assessment, and one broader lake-wide survey (Erwin and Holly 2006). This work indicates that the archaeologically richest area of Birchy Lake is in the Sheffield Brook delta, on the lake's southeastern shore. Unfortunately this area, along with the entire lakeshore, has suffered extensive erosion as a result of hydroelectric operations which began early in the twentieth century. Consequently, the original contexts of archaeological deposits on the lake have been mostly

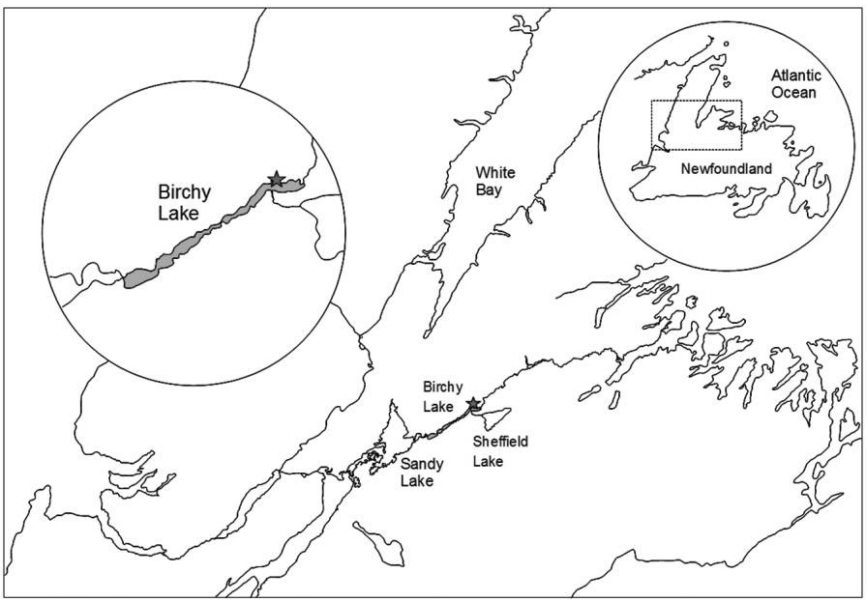

Figure 1. The Island of Newfoundland and the location of Birchy Lake and DiBd-1.

lost. One site discovered in 2005 on the north shore of the lake, directly across from the Sheffield Brook delta, however, retained some in situ deposits. This site, known as Birchy Lake-9 (DiBd-1), was excavated in 2007 (see Holly and Erwin 2009) (Figure 2).

A Grease Rendering Feature

Excavations at DiBd-1 revealed a large feature composed of fire-cracked rock (FCR), calcined bone, deposits of charcoal-stained soil, and associated artifacts affiliated with the Beaches complex. The Beaches complex spans from AD 100 to 1100 and is part of a broader regional Amerindian (known as "Recent Indian") tradition that begins at the turn of the first millennium and continues into the "historic" period with the aforementioned Beothuk of the island and the Innu (formerly Montagnais and Naskapi) of neighboring Quebec and Labrador (Holly 2013). Beaches assemblages consist of triangular and elongated bifaces, blocky scrapers, and large side-notched projectile points, most of which are thought to represent atlatl darts (Erwin et al. 2005). Similar tools recovered at DiBd-1 support a Beaches complex affiliation for the site (Figure 3).

A Beaches affiliation is also supported by radiocarbon dates obtained from two different burned terrestrial mammalian bone fragments recovered from the bone-mash feature at DiBd-1. The first sample (Beta-390748) returned a conventional radiocarbon age of 1100 ± 30 BP and a calibrated age (2 σ) of cal AD 885 to 1015; the second (Beta-388488), a conventional radiocarbon result of 1260 ± 30 BP and a calibrated age

Figure 2. DiBd-1 before excavation, looking south across the lake.

Figure 3. Selection of Beaches complex artifacts from DiBd-1.

(2 σ) of AD 670 to 800. Although there is a gap between the age ranges of the two samples, the small and discrete nature of the site and the lack of any overlapping features or observable stratigraphic separation do not suggest reuse of the feature or reoccupation of the site. Overall the radiocarbon results fall comfortably within the accepted date range of the Beaches complex, and together with the collected artifacts they suggest that Amerindians were at the site sometime between the eighth and ninth centuries AD.

The bone-mash feature at DiBd-1 measures roughly three meters in length and a meter wide and represents activities associated with rendering grease (Figure 4). Grease rendering is widely documented in the ethnographic and archaeological record (Binford 1978; Brink 1997; Heinrich 2014; Henriksen 1973; Jenkinson and Ashini 2015; Karr et al. 2015; Loring 1997; Munro and Bar-Oz 2005; Outram 2001; Prince 2007; Spiess 1979). Typically, grease rendering was achieved by first cracking the long bones of animals to extract the marrow and then pulverizing the bone ends and shafts into a kind of "mash," which was deposited into containers of boiling water (Prince 2007:4; Speth and Spielmann 1983:19; Spiess 1979:25). The grease rendered from the mash was subsequently collected from the surface of the water, allowed to solidify, and then consumed or stored (Binford 1978:157–65; Henriksen 1973:37; Spiess 1979:25; Vehik 1977: 171). Where pottery was not available—as was generally the case in the Eastern Subarctic—hot stones collected from hearths were dropped into birchbark containers to heat the water the grease was rendered in (Karr et al. 2015:4; Skibo 2015). The thermal shock involved generates significant amounts of FCR (Graesch et al. 2014).

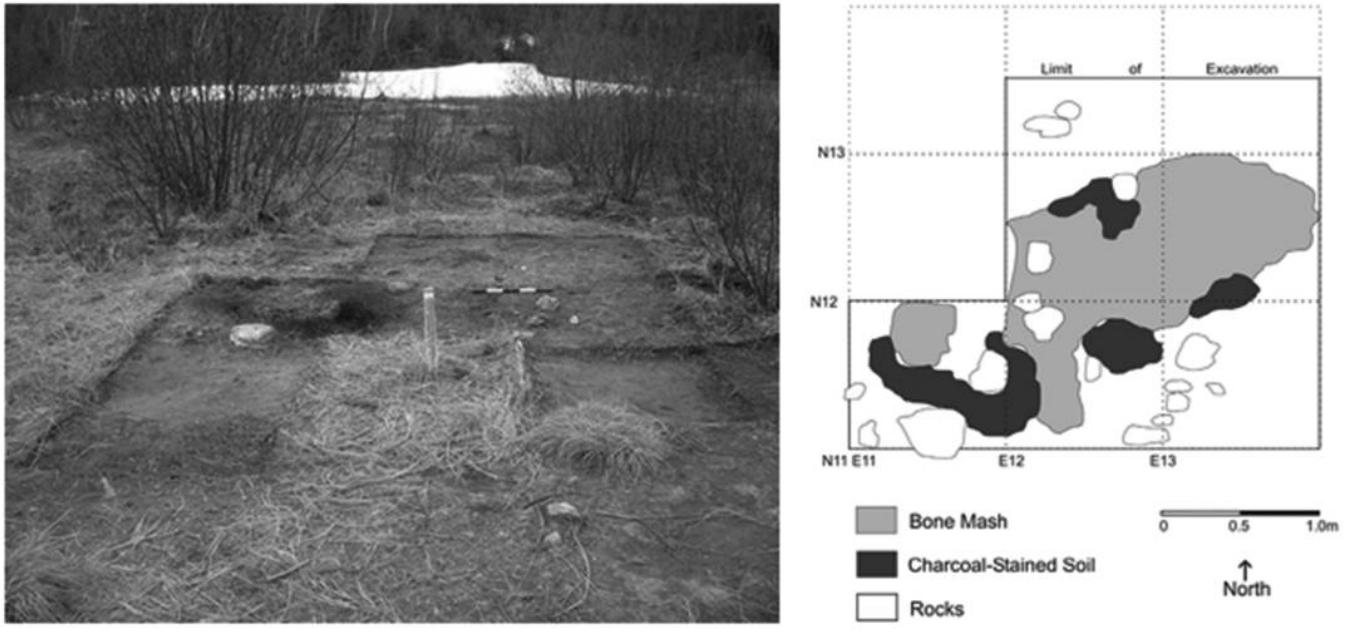

Figure 4. Grease-rendering feature at DiBd-1, looking north.

We interpret FCR associated with thick deposits of calcined bone fragments at DiBd-1 to be the result of "dump events" following grease rendering. Calcination likely occurred when the discarded bones were deposited in active hearths or were burned by hearths subsequently situated in the depositional matrix. The bones may have been intentionally burned in accordance with conventions for the proper treatment of animal remains, a primary concern of native peoples throughout the Subarctic. As a matter of respect—and relatedly to make the remains inaccessible to scavengers—animal bones are placed on scaffolds, poles, or in trees, under water or rocks, and in pits (Armitage 1992; Brightman 1993:1; Gordon 1980; Honigmann 1956:69, 1964: 350; Jenkinson and Ashini 2015; Speck 1977; A. Tanner 1979; V. Tanner 1947: 643); they may also be burned (Gordon 1980:9; Tanner 1947:643).

Some bone-mash deposits in the Eastern Subarctic are thought to be the remnants of eat-all feasts called Makushans. A Makushan involves the ritual consumption of significant quantities of meat and grease as a way of honoring and maintaining good social relations with the animal world, a necessary prerequisite for hunting success (Armitage 1992; Bouchard 2006:169; Brightman 1993; Henriksen 1973; Loring 1997; Speck 1977; Tanner 1974, 1979; Westman 2015). Since Makushans centered on hearths nested within elongated tent structures (see the journals of James Clouston 1819–1820 in Davies 1963:49), archaeologists sometimes take the presence of a neatly aligned sequence of hearths or a single long, linear hearth associated with bone mash to be the remains of Makushans. It is not clear, however, if all such features represent ritual activity (Stopp 2008:114).

The bone-mash feature at Birchy Lake was roughly oval and contained irregularly shaped pockets and concentrations of charcoal and FCR. It offers no clear archaeological signature of a Makushan, but this does not mean that the grease-rendering activities that took place at Birchy Lake were not of some spiritual import. One could make the case that all subsistence activities were (see Armitage 1992; Brightman 1993; Speck 1977). Certainly if the occupants of the site were rendering grease and consuming food under desperate conditions—as we argue below—it is logical to think they would have been very concerned about how their actions would be understood by the animal/spirit world. Some indication of this might be read in the burned bone remains at the site, which could represent the proper disposal of animal remains (see Gordon 1980:91; Jenkinson and Ashini 2015; Tanner 1947:643); in a rare Ramah chert biface—fashioned from a stone sourced 1000 km away in northern Labrador—which was recovered, burned, from the bone-mash feature and might have been an offering (see Loring 1989:61; Schwarz 1993:70); and maybe even in a small incised bone object that was found in the feature and might have been used to divine the prospects for finding food in the future (Holly and Erwin 2009:74) (Figure 5).

Conventional thinking is that bone grease is costly to produce in terms of time, energy, and fuel, and that the return on the investment is low (Binford 1978:32; Church and Lyman 2003; Speth and Spielmann 1983:19). In one experiment, for instance, it took a researcher some twenty hours of hard labor to clean, break, and boil bones just to

Figure 5. Burned side-notched Ramah chert projectile point and incised bone object from DiBd-1.

produce a quarter pound of fat (Saint-Germain 1997:155). This has led some to assert that grease-rendering is a sign of subsistence stress (Binford 1978:32; Burch 1972:362; Heinrich 2014; Munro and Bar-Oz 2005) and, by extension, that the intensity of bone fragmentation and estimates of the value of body parts selected for processing can be used to assess the degree of stress people were under (Madrigal and Holt 2002; Marshall and Pilgrim 1991; Munro 2004; Outram 2003; Ugan 2005; Wolverton et al. 2008). But grease was not only a starvation food. The fats within bone—both marrow and grease—provide critical nutrients for peoples with a lean meat diet (Church and Lyman 2003; Speth and Spielmann 1983). Fats also have social and ideological value. On the Northwest coast of North America, bone grease was consumed as a prestige food at feasts (Prince 2007:21–22), and in the Eastern Subarctic at the aforementioned Makushan feasts. Additionally, bone fats, including bone grease from elements typically ranked low for their meat yield and presumed utility, are often held in high regard for their taste (Bouchard 2006:151–53; Jin and Mills 2011; Morin 2007). Finally, recent experimentation has challenged some previous assumptions regarding the amount of time and effort required to fracture and pulverize bone (Church and Lyman 2003; Jin and Mills 2011). Accordingly, given the varied use of bone grease, the reduced costs of producing it, and its benefits, archaeological interpretations of the meaning and significance of grease rendering require detailed analyses of bone-mash deposits and careful consideration of cultural context (Heinrich 2014; Jin and Mills 2011; Karr et al. 2015; Prince 2007).

Faunal Analysis and Seasonality

Approximately 34,195 fragments of calcined bone were recovered from the bone-mash feature at DiBd-1. In most cases the poor condition and small size of individual fragments precluded the identification of taxon and element. Of the total sample only 6.9% of the assemblage could be identified below the resolution of mammalian. The vast majority of the identifiable remains were woodland caribou (*Rangifer tarandus cari-*

bou), followed distantly by beaver (*Castor canadensis*) and then by an assortment of small game, including otter (*Lutra canadensis*), hare (*Lepus* sp.), marten (*Martes americana*), muskrat (*Ondatra zibethicus*), canid (probably fox, *Vulpes vulpes*), and bird (Table 1). Together they represent nearly the entire terrestrial mammalian spectrum that was available on the island in antiquity. A number of specimens only could be identified to the level of element and relative body size, but not family, genus, or species. Of these, the medium-sized category almost certainly includes beaver, the medium-small category is fox-sized, and the small category could well represent parts of hare, marten, and muskrat. These are worth noting for the evidence they provide for the use of terrestrial mammals other than caribou.

Caribou remains constitutes nearly 70% of the identified assemblage, and likely the bulk of the undiagnostic bone fragments, indicating that this animal was the primary target of hunters camped at Birchy Lake. Caribou are present on the island of Newfoundland throughout the year, but for most of it they are dispersed into small groups (Bergerud 1983:132). During the spring and fall migrations, however, caribou are available in larger numbers and can be intercepted by hunters at particular places on the landscape. Clusters of sites and dense deposits of archaeological material along rivers and lakeshores in the interior of the island (Schwarz 1992:32), such as the Sheffield Brook delta area of Birchy Lake, likely indicate where these ambushes regularly occurred.

The fall migration was the ideal time to hunt caribou. At this time of the year caribou are rich in fat from summer feeding and their coats are in luxurious shape, and ethnographic and archaeological evidence from northern North America attest to the importance of the fall hunt (Balikci 1970:38; Gordon 1996:15; Loring 1997:199–

Table 1. Faunal remains from DiBd-1 identified to taxon or relative body size, excluding unidentified large mammalian fragments.

Taxon	Common name	NISP	%NISP
Rangifer tarandus	Caribou	1642	69.7
Castor canadensis	Beaver	233	9.9
Canidae	Fox, small wolf	51	2.2
Lutra canadensis	River otter	19	0.8
Lepus sp.	Hare	39	1.7
Martes americana	Marten	7	0.3
Ondatra zibethicus	Muskrat	4	0.2
Mammalia, medium	Mammals (beaver-sized)	254	10.8
Mammalia, medium–small	Mammals (fox-sized)	35	1.5
Mammalia, small	Mammals (muskrat, hare, or marten-sized)	67	2.8
Aves	Unidentified birds	2	0.1
Total identified		2353	100

200; Lytwyn 2002:103; Sharp and Sharp 2015:178–79; Spiess 1979:29; Stenton 1991; Stewart et al. 2004:197; Turner 2001:276). On the island, the attractiveness of caribou in the fall was further bolstered by the relative dearth of alternative subsistence options then available. By fall, most migratory birds would have left the island, key fish resources moved offshore, and seal populations dispersed (Kristensen 2011: 295; Steele 1983:445–46; Tuck and Pastore 1985:75). Therefore, in terms of food, caribou would have had few rivals for the attention of native peoples during the fall migration period.

It is exceedingly difficult to assess seasonality directly from the DiBd-1 faunal assemblage on account of the calcined condition of most of the bones and their highly fragmented nature. The season of death for caribou is often determined from dentition, mandibular growth, the development of antlers, and growth regression for some elements (Enloe and David 1997:57; Morrison 1997; Morrison and Whitridge 1997; Pike-Tay et al. 2000; Spiess 1979), but the Birchy Lake assemblage lacks both complete teeth and recognizable antler pedicles, and it contains few elements complete enough to provide useful measurements. Small antler tine fragments were identified (Table 2), but these could represent spring growth for stags or fall antlers of either males or females (Dugmore 1913:26, 42).

Table 2. Frequency and percentage of caribou remains by element or skeletal region.

Element	*N*	% of Total Caribou
Phalanges, including dew phalanges	1052	64.1
Carpals, tarsals, and sesamoids	220	13.4
Metacarpals, metatarsals, and dew metacarpals/metatarsals	57	3.5
Radius	25	1.5
Ulna	30	1.8
Humerus	17	1.0
Scapula	4	0.2
Tibia	12	0.7
Femur	2	0.1
Pelvic	7	0.4
Vertebrae	45	2.7
Ribs	89	5.4
Skull fragments	65	4.0
Mandible	8	0.5
Teeth	2	0.1
Antler	7	0.4
Total	1642	100

Consideration of the caribou's life cycle does not offer clear answers either. From wildlife studies, we know that Newfoundland's caribou calve over a very short period of time, around 14 days between late May and early June (Bergerud 1975:1219, 1983:132). This occurs after the spring migration, which peaks between mid-April and early June (Mahoney and Schaefer 2002:961). Many does taken during a spring hunt could thus be expected to be pregnant (Enloe and David 1997:56), although Bergerud (1971:11) identified quite a few pregnant does in the fall too. The Birchy Lake faunal assemblage lacks clear examples of either fetal or neonatal caribou bones. This could in part be a result of taphonomic processes destroying the generally less-dense bones of the very young (Symmons 2005:1694), although some could be present among the fragments included in the unidentified medium-sized mammal category. The absence of definitively identified fetal bones could also reflect the special treatment and disposal of fetal remains, as was practiced by the Innu (Bouchard 2006:41, 66; Henriksen 1973:38, 79). However, given the possibility of pregnant does in both the fall and winter, even the occurrence of fetuses would not serve as an unequivocal seasonal indicator.

A consideration of skeletal growth also yields equivocal results. Newborn caribou calves are reportedly soon sturdy enough to travel with their mothers and then undergo little growth from the fall to the next spring (Bergerud 1971:12). Not surprisingly then, Pasda (2009:1–2, 48–49) reports for western Greenland's modern reindeer (*Rangifer tarandus groenlandicus*) epiphyseal fusion rates that have broad ranges, vary between individuals, and yield estimates that can differ considerably from true age. Among the caribou bones in our assemblage are a wide range of unfused epiphyses, including proximal phalanges, distal metacarpals and metatarsals, distal and proximal ulna, distal and proximal radii, and vertebrae. But the use of each of these to estimate age at death is fraught with the difficulties cited by Pasda (2009), such that we are unable to distinguish between calves killed in the fall or yearlings killed in the spring.

Similar problems arise when interpreting the season of death of the next most abundant taxon—beavers. Beavers on the island give birth between late May and early June (Bergerud and Miller 1977:1483), roughly coincident with the end of the spring caribou migration and the beginning of the calving period. There are elements in the Birchy Lake assemblage representing beavers of a range of body sizes and ages, including unfused phalanges, metacarpals and metatarsals, radii, and vertebrae. None are definitively identified as new kits, or one-year-olds of either the spring or fall, as the beaver skeleton is slow to fuse (Fandén 2005:205; Robertson and Shadle 1954). The food supply for beavers in Newfoundland is also reportedly sparse, which may have worked to both keep populations low (Tuck and Pastore 1985:76) and slow maturation rates.

Contextual evidence, however, suggests that the site was occupied at the time of the spring caribou migration. DiBd-1 is unusual for being located on Birchy Lake's north shore. The densest archaeological deposits on the lake are found directly across from DiBd-1 in the Sheffield Brook delta, on the lake's southern shore. This pattern is not unique to Birchy Lake. Most archaeological sites in the interior of the island are

found on the south side of lakes and rivers (Holly 2008:180–81). Plausibly this pattern reflects both the strategy used to hunt caribou and the seasonality of the typical caribou hunt (e.g., Stewart et al. 2004).

Migrating caribou were likely killed as they crossed bodies of water and then hauled up on the opposite shore from where they entered the water for processing. Lucien Turner, for instance, noted in 1894 how the Innu established a camp in advance of an expected river crossing and from there scanned "the opposite hillsides for deer filing along the narrow paths through the forests and bushes toward the river bank." Then, after the animals entered the water and the ambush was sprung, they worked from canoes to keep the caribou from retreating to the shore from which they entered the water while driving them "toward the shore where the camp [was] situated" (Turner 2001:277). The late summer caribou hunt of the Netsilingmiut of the central Canadian Arctic essentially worked the same way. As Balikci (1970:43–44) describes it, hunters positioned themselves on the camp side of the lake and spied for caribou on the opposite shore. Then, when the caribou entered the water, so did the hunters. From kayaks, they speared the swimming animals while women and children tried to keep stray and panicked caribou from making landfall on the camp shoreline.

We surmise that killing caribou while driving the swimming herd toward a camp that was located on the opposite shore from where the animals entered the water was the preferred way to hunt caribou at water crossing sites. Conversely, if hunters directed caribou back toward the "crossing" side of the shore where the animals entered the water, the herd's movements could be disrupted and the success of the hunt jeopardized. Furthermore, if there was no camp on the crossing side of the shore, no one would be there to keep the caribou from exiting the water and escaping—and it is doubtful that camps would have been established on the crossing side ahead of the hunt since the camp's placement there would risk exposing the ambush. As Sharp and Sharp (2015:224) note: "if there is a camp, it has to be far enough away from the crossing for the sight, smell, and noise of it not to deflect approaching caribou away from the crossing" (see also Balikci 1970:43; Stewart et al. 2004). Spiritual rather than simply strategic concerns may have figured into such decisions too. A Kivallirmiut elder from the Baker Lake region west of Hudson Bay, for instance, noted that food was not cached and animals were not butchered on the crossing side to keep it "clean" and the caribou unsuspicious (in Stewart et al. 2004:198). The Netsilingmiut considered caribou crossing sites "holy ground" (Balikci 1970:46).

Where the caribou would cross the water would have been surmised by past migration patterns and intimate knowledge of animal behavior. Technology, such as fences, known to have been used by the later Beothuk (Marshall 1996:329), could have been employed to help channel caribou into crossing at particular places on the landscape. The aforementioned clustering of sites along interior waterways certainly suggests that caribou crossing locations could be reasonably predicted, if not also determined to some extent with fences or other technology and techniques.

If, as we surmise, campsites and processing occurred on the shore opposite from where caribou entered the water, the archaeological implications are clear: sites situated on the southern shores of rivers and lakes should represent the hunting of caribou during the fall migration (when the herds are making their way south), and sites on the northern shores of rivers and lakes, caribou hunting in the spring (when the herds are moving north). With this in mind, the tendency of archaeological sites in the interior of the island to be positioned on the south side of rivers and lakes probably reflects the traditional importance and popularity of the fall hunt (Holly 2008).

In contrast, the spring migration would have been a less attractive time to hunt caribou. By spring the fat available on male caribou has been depleted by the fall rut and the subsequent lean months of winter feeding (Burch 1972:342; Speth and Spielmann 1983:3). Females actually reach their peak weight during pregnancy in the spring but have lower fat reserves than males to begin with and also undergo fat depletion during the winter (Burch 1972:343, 362; Speth and Spielmann 1983:9). Caribou coats are also unsuitable for clothing and other purposes in the spring because of the burrowing of warble fly larvae into the animal's skin (Burch 1972:343, 362; Lytwyn 2002:86; Sharp and Sharp 2015:179; Stenton 1991). Additionally, unlike the situation in the fall, better resource alternatives are generally available to hunters on the coast—namely, harp seal. In early spring, vast herds comprising millions of harp seals start to make their way north past the island; they offered such an abundant resource that all of the native peoples of the island appear to have hunted them then (e.g., Cridland 1998; Renouf 1993; Spiess 1992:169). They also provided a critical source of dietary fat in the form of blubber (Nagaoka 2006:1476; Stopp 2002:312), which would have been highly prized during the lean early spring months—typically the hungry season in the north (Eidlitz 1969:120). Some migratory seabirds, inshore fish, and harbor seals may have also been available on the coast at this time.

Given the relative abundance and nutritional value of coastal resources, caribou hunting in the spring could in itself be a sign of subsistence stress. Whereas bone-grease rendering practiced during the fall and winter may have been socially motivated (Henriksen 1973:35; Loring 1997:195), the association between the consumption of lean ungulate meat in the spring, including that of caribou, and the intensive reduction of bone to extract fats embedded within them is well demonstrated (Brink 1997:271; Burch 1972:363; Speth and Spielmann 1983:19). During times of starvation, typically a spring event in the north, the Innu of Labrador even sometimes went so far as to collect bone-mash deposits from old campsites and reboil them for grease (Jenkinson and Ashini 2015:95). And if people were unable to procure seal blubber, one can imagine how critical it would have been to obtain caribou bone fats in the spring.

The DiBd-1 faunal assemblage indicates both intensive processing and the reduction of a wide variety of bone elements, as might be expected under conditions of stress. The average size of each bone fragment was only 3.6 g. Burning to a calcined state is known to contribute to bone fragmentation but, by itself, would not be ex-

pected to produce the uniformly small fragments evident in this assemblage or to differentially affect elements of different shapes (Waterhouse 2013:1116). Burning tends to produce fractures with perpendicular angles (Herrmann and Bennett 1999:464), and although spiral fracture outline shapes can be produced by various taphonomic agents (Outram 2001:403) and cannot always be equated with human reduction, it is notable that in examination of a sample of 869 cortical bone fragments from the unidentified portion of our assemblage, 283 (32.6%) displayed only spiral outlines, 218 (25.1%) had a combination of perpendicular and spiral edges, and 368 (42.3%) had only perpendicular or stepped edges. This increases our confidence that the small size of the specimens in our assemblage is not solely the result of calcination. Rather, it is consistent with efforts to maximize the extraction of bone grease (Church and Lyman 2003; Outram 2001; Prince 2007:12).

The extent of fragmentation of the caribou skeletons is also notable and suggestive of extreme measures. Since Binford (1978:33–34) published his marrow and bone grease utility indices for ungulate elements, which were based on expected yield, quality of fats, and bone density, there has been much discussion over how to interpret the elements represented in bone-mash deposits and the taphonomic processes and cultural choices at work in their formation (e.g., Brink 1997; Darwent and Lyman 2002; Jin and Mills 2011; Morin 2007; Prince 2007). One of the enduring expectations has been that flat bones, such as scapula, rib, vertebral, pelvic, skull, and mandible fragments, which yield little fat and are low in oleic acid, would only be processed in times of extreme need (Binford 1978:469–70; Karr et al. 2015:6–10), yet instances of processing these bones with entire skeletons (Burch 1972:19; Spiess 1979:25), as well as preferentially selecting them for the drier, crumbly quality of their "yellow" grease, have been observed (Morin 2007:72; Vehik 1977:170). Thus, while the presence of fragmented caribou flat bones at Birchy Lake does not by itself point to some unusual need, their quantity is notable (Table 2). Further, the only caribou bones surviving whole are sesamoids, dew phalanges, and a few discoid or spheroid carpals and tarsals—which yield little to no grease (Darwent and Lyman 2002:359). However, there are even a few fragmented examples of these elements.

A large number of caribou phalange fragments have also been identified in the Birchy Lake assemblage ($n=1052$, 64.1% of the caribou remains). As reviewed by Jin and Mills (2011:1799), the use of deer phalanges for grease rendering is often interpreted as a sign of extreme dietary stress because of the lack of meat around them, their small marrow cavities, presumed low grease value, and the effort thought to be involved in extracting the bones from the hooves and cracking them open. Other studies suggest, however, that these elements require relatively little effort to process (Darwent and Lyman 2002; Jin and Mills 2011) and yield a very palatable and highly desired kind of fat (Morin 2007). In particular, Morin (2007:80–81) cites accounts of Arctic travelers who emphasized the superior quality and importance of fat from, and close to, caribou hoofs. Even given the equivocal nature of the arguments arising over the relative value of skeletal parts, it is significant that there is a lack of preferential se-

Table 3. Terrestrial mammal species identified at interior Amerindian sites on the island of Newfoundland[a]

Site Name (Number)	*N* of Species	Species Represented	Reference
Russell's Point (CiAj-1)	3	beaver, muskrat, caribou	Gilbert 2002
Indian Point (DeBd-1)	2	beaver, caribou[b]	Stewart 1971
Wigwam Brook (DfAw-1)	4	Arctic hare, beaver, red fox, caribou	Stewart 1973
Deer Lake Beach (DhBi-6)	2	beaver, caribou	Reader 1998
Birchy Lake 9 (DiBd-1)	7	Arctic hare, beaver, otter, muskrat, red fox, marten, caribou	(This research)

[a] only sites with faunal assemblages that have been systematically studied are included in the table
[b] moose was also identified at the site, but excluded here since moose was not present on the island prior to the late nineteenth century

lection of caribou elements for fracturing in the Birchy Lake assemblage, beyond those carpals, tarsals, and sesamoids that were left intact. In short, it seems that all of the elements that could yield grease were utilized, as would be expected during episodes of subsistence stress.

The remains of small game in the assemblage, including beaver, otter, hare, marten, canid (fox), muskrat, and bird, were also highly fragmented and thus plausibly boiled for grease too; they may represent additional efforts to obtain fat (Speth and Spielmann 1983:19). The presence of small game could also indicate the pursuit of suboptimal resources during a time of food stress. The interior of the island does not offer much in the way of terrestrial food options aside from caribou and beaver (Pastore 1989:53–54). Accordingly, the presence of small terrestrial game, and an assemblage that captures nearly the entire terrestrial mammalian spectrum of the island, suggests that people were adding marginal food resources to supplement their diet and perhaps extend their stay on Birchy Lake beyond the spring caribou hunt. For some comparison, only one interior site on the island has produced a faunal assemblage that includes four terrestrial mammal species. This is the famous Wigwam Brook site, which is thought to have been occupied during the Beothuk's difficult last days when they were living in the interior for long periods of time—including the spring (Stewart 1973). All other faunal assemblages from interior sites exhibit even less terrestrial mammalian diversity (see Table 3). In comparison, the Birchy Lake faunal assemblage contains the remains of seven different kinds of terrestrial mammals and also birds—dietary breadth that seems fully consistent with "bad year" economic behavior.

A BAD YEAR ECONOMY IN CONTEXT

We believe that the site's location, extent and intensity of bone processing, presence of a wide range of terrestrial faunal resources, and lack of age indicators clearly pointing to death during other seasons suggest a people trying to find meat and fat in the interior of the island during the spring. If so, it begs the question of why anyone was

there at that time of the year when the prospects for finding both were better on the coast. Between March and May, harp seals are available to hunters as they moult and bask on the sea ice. At this time they may be approached by boat or sometimes even on foot via the land-fast ice that extends out from the shoreline. Harp seals, however, can be difficult to reach if winds and storms keep the ice far out at sea (Pastore 1989:53; Tuck and Pastore 1985:74). Their availability can also vary annually or at longer time-scales as a result of broader climate patterns that affect sea ice distribution (Renouf 1993:206). Thus, one possibility is that the people who camped at Birchy Lake were simply forced to look inland for food because of poor seal-hunting conditions on the coast.

Social conditions, however, may have also played a part in their decision. DiBd-1 was occupied sometime during the eighth or ninth century AD, during an incredibly dynamic and complex time in the island's history. Some 700 or so years earlier the Amerindian ancestors of the people who camped at Birchy Lake arrived on the island, probably from southern Labrador and the lower north shore of Quebec, to find the land already occupied by Paleo-Inuit peoples. The Paleo-Inuit tradition on the island of Newfoundland extends all the way back to about 800 BC and includes both an early Paleo-Inuit period, represented by the Groswater complex (800 BC to AD 100), and later Paleo-Inuit period, represented by the (middle) Dorset (AD 1 to 900). The relationship between Groswater and Dorset on the island is not fully understood, with some archaeologists asserting they represent two independent waves of settlement and others surmising a more integrated development (Fitzhugh 1980:598; Renouf 1994:191–92; Ryan 2016; Tuck and Fitzhugh 1986). Either way, we know that Amerindians arrived to find the island inhabited by Paleo-Inuit peoples and that for centuries they "shared" it with them. This period of co-occupation ends by AD 900 with the archaeological disappearance of the Dorset, the result of either their abandonment of the island or "extinction" on it (Renouf 1999; Renouf and Bell 2009:269; Tuck and Pastore 1985).

The Dorset are known for their intensive maritime-focused subsistence and settlement strategy. They established a number of large settlements along exposed areas of the coast and focused their attention on marine-resources, especially harp seal. The extraordinary Dorset Paleo-Inuit component of the Phillip's Garden site on the island's Northern Peninsula has yielded hundreds of thousands of harp seal bones and the remains of more than a hundred dwellings (Hodgetts et al. 2003; Murray 2011; Renouf 2011; Wells et al. 2014); it is one of the largest sites in all of northern Canada (Renouf 2011:155). It appears to have been the site of a very large semi-permanent settlement that was oriented toward both the spring and early winter harp seal hunt. Less impressive but still quite-large Dorset sites dot the coastline elsewhere on the island (Renouf and Bell 2009:268) and were probably also situated for seal procurement. By comparison, evidence of the Dorset presence in and near the interior of the island is ephemeral and, where found, suggests a focus on fish (Barnable 2008; Schwarz 1992:20–22, 27, 1994:62). Caribou were probably not a significant food resource for the Dorset on the

island; remains of the animal are rare—and unexpectedly so—in Dorset faunal assemblages (Renouf 2000; Wolff et al. 2010:129; but see Murray 1998). Their absence may reflect special cultural prescriptions for the disposal of caribou that precluded them from being deposited with seal (Renouf 2000:72), but we might also reasonably infer from both their scarcity in faunal assemblages and the coastal orientation of Dorset sites that caribou contributed relatively little to the Dorset food economy.

The Amerindians who camped at Birchy Lake and shared the island with the Dorset had an altogether different strategy (Holly 2002b, 2005). Sites attributed to the Beaches complex are found in both the interior and on the coast. Interior sites include the Deer Lake Beach site (DhBi-6), located in the western portion of the island. Excavations there by David Reader (1998) exposed the remains of two linear hearth features, which were probably located within the confines of separate elongated dwellings. Analysis of the beaver and caribou remains found at the site, as well as the recovery of a charred pin cherry seed and blueberry, point to an occupation between fall and early winter (Reader 1998:55). Beaches complex sites are also found on the coast. A particularly dense concentration of artifacts and associated cobble hearth features litter the so-called straight shore of northeastern Newfoundland (Austin 1984; Carignan 1977). They likely represent the ruins of a people who were hunting seals and birds there in the spring and summer. Overall, Beaches sites are small and have only produced ephemeral and indirect evidence of dwellings and few artifacts. Together they suggest a mobile people who practiced a generalized subsistence strategy that was oriented toward the exploitation of both terrestrial and marine resources.

It is not known how Paleo-Inuit and Amerindian peoples got along. There is no good evidence of direct trade between the two, which if present, could be interpreted as a sign of friendly relations. In nearby Labrador it has been suggested that Paleo-Inuit peoples may have had a hand in providing Ramah chert to Amerindians based on the fact the Dorset had a strong presence in the area of the quarry and that Amerindian sites well south of it contain abundant amounts of the material (Loring 1988; Stopp 2008). Even enemies, however, sometimes deemed quarries "safe zones" or "neutral ground" (Bessire 2014:53–57; Bryan 1950:34; Holmes 1919:262), which may mean that Amerindians could access the quarry—but not that they were allies and trading partners of the Dorset. Or maybe they were both trading partners *and* enemies; the two are not mutually exclusive (Keeley 1996:121–26; Nielsen 2009:238).

The nature of Amerindian–Paleo-Inuit relations is no clearer on the island of Newfoundland. Some have suggested that the different land-use patterns and subsistence economies employed by Paleo-Inuit and Amerindian peoples functioned as a risk-reducing strategy designed to share information and resources in a challenging environment, and thus that relations between the two groups were cooperative and complementary (Renouf 2003; Renouf and Bell 2009; Renouf et al. 2000). One could, however, reasonably draw the opposite conclusion from such differences—that relations were competitive and unequal (Holly 2013). Given the large size and overwhelming number

of Dorset sites (268 to just 42 Beaches sites), it is likely that Paleo-Inuit people outnumbered Amerindians and dominated the coastal landscape (Renouf 2003:10; Renouf and Bell 2009:268). We know that the Dorset had a significant presence on the Point Riche Peninsula where the Phillip's Garden site is located, and that this was likely the best place to hunt harp seals on the island during the first millennium AD. They also had a significant presence at several other prime sealing areas on the island, such as at Cape Ray in the southwestern corner of the island (Fogt 1998), lower Trinity Bay in southeastern Newfoundland (LeBlanc 2003; Robbins 1985; Wolff et al. 2014), and the Baie Verte Peninsula on the island's north-central coast (Erwin 2003). With this in mind, it is perhaps telling that few Amerindian sites are found in these areas when the Dorset were living there, but that Amerindians show up there and elsewhere on the coast shortly after the Dorset abandoned them (Bell and Renouf 2008:86; Holly et al. 2015:2–4; Renouf 2003:9–10; Renouf and Bell 2009:271–74). This would seem to suggest that the Dorset were occupying highly desirable places on the landscape and that Amerindian peoples were marginalized, to some extent, by the Dorset presence there.

If so, might the Amerindian occupation at DiBd-1 on Birchy Lake reflect the actions of a people who were having trouble accessing spring harp seal herds in part because of the Dorset (Holly 2013:100–101)? The Dorset had a major and enduring presence on the Baie Verte Peninsula, located just north of Birchy Lake. There, they hunted harp seals and quarried soapstone for manufacturing vessels and lamps which they exchanged with other Dorset peoples throughout the broader Newfoundland and Labrador region (Erwin 2003, 2005, 2016). Radiocarbon dates also indicate that the Dorset were on the peninsula and elsewhere on the island when Amerindians were hunting caribou on Birchy Lake (Table 4).

Finally, we may also understand the Amerindian occupation of Birchy Lake as part of a broad cultural response to a changing environment and resource conditions in the late first millennium AD. The western North Atlantic began warming about AD 500. On the island of Newfoundland this warming trend—known as the Medieval Climatic Anomaly—peaked around AD 900 (e.g., Levac 2003:fig. 6; Rosenberg et al. 2005; Solignac et al. 2004). Probably not coincidently, this is when the Dorset disappear from the archaeological record. Archaeologists suggest that their decline was tied to the decreased availability of harp seals owing to shifting and shrinking sea-ice in the region (Bell and Renouf 2008). The Point Riche Peninsula seems to have been the canary in the coalmine. There, at the Phillip's Garden site, signs of trouble can be read in the rapidly shrinking size of the settlement (Erwin 2011) and houses (Anstey and Renouf 2011), and a dietary shift from seals to seabirds (Hodgetts et al. 2003) that culminates with the Dorset's abandonment of the site in the ninth century. Other Dorset sites on the island fall soon after, perhaps precipitated by the collapse at Phillip's Garden (Bell and Renouf 2008).

And yet, Amerindian people weathered these same environmental changes and persevered. Why they succeeded and the Dorset failed is not known, but it may

Table 4. Late (post-1300 BP) radiocarbon dates from Dorset Paleo-Inuit sites on the Baie Verte Peninsula (EaBa-1 and EaBa-10) and elsewhere on the Island of Newfoundland

Site Name (Number)	Lab Number	Uncalibrated 14C Result	Calendar Age (OxCal 4.2)
Bordeaux 2 (CkAm-5)	GaK-3275	1090 ± 90	AD 1059
Fleur de Lys 1 (EaBa-1)	Beta-15675	1220 ± 110	AD 1021
	Beta-129941	1520 ± 50	AD 632
Fox Bar (DeAk-3)	S-1001	1255 ± 65	AD 896
Phillips Garden (EeBi-1)	Beta-15639	1250 ± 60	AD 895
Shelley Garden (EaBa-10)	Beta-15676	1270 ± 90	AD 969
	Beta-15674	1480 ± 100	AD 714
Stock Cove (CkAl-3)	Beta-4062	1280 ± 60	AD 884
	Beta-4065	1280 ± 60	AD 884

Source: Canadian Archaeological Radiocarbon Database (CARD; http://www.canadianarchaeology.ca)

be that the Dorset's commitment to the coast and their cultural conservatism doomed them when conditions changed (Holly 2011). By the same logic, Amerindians may have been spared the same fate because their generalized subsistence strategy—particularly an inland component that included caribou—was better suited to the evolving environmental situation. If so, the irony is that the Dorset's prior command of the coast might have ultimately helped "preadapt" Amerindians for a situation that would unfold in their favor centuries later.

CONCLUSION

The springtime hunting of caribou and other game at Birchy Lake was likely a response to poor resource conditions on the coast in what was probably remembered by those who survived it as a pretty bad year. To make sense of it, we might think of their solutions—subsistence diversification and mobility (i.e., resource flexibility)—as a calculated risk management strategy that was designed to cope with a marginal and unpredictable natural environment. But we suggest that their decision was also informed by social and historical processes. For 5,000 years the island had been home to a variety of different hunter-gatherer societies who each used the landscape and the island's resources in a different way. What we might call tradition, or cultural precedent, probably played some role in their constitution. Both early (Groswater) and later (Dorset) Paleo-Inuit peoples, for instance, exhibit a strong maritime orientation and a focus on the exploitation of seals and other sea mammals. It is the southern expression of a tradition that was forged long ago in the far north. In a similar way, Amerindian peoples probably sought to reproduce the boreal-forest lifeways that their ancestors had practiced on the mainland when they adopted a generalized

coastal-terrestrial subsistence strategy—including an emphasis on caribou—on their new island home.

People, of course, are not bound by tradition: they "acclimatize" to novel resource environments, develop aspirations and then pursue them, and are always responding to unfolding social situations. The Beothuk Indians of the island are a good example of this. Without the growing presence of Europeans on the coast and the poor state of relations with them, they would have likely remained on the coast forever, but because the social conditions on the ground had changed, the Beothuk could not, and so they turned to the interior and elaborated on what had previously been only one component of their "traditional" subsistence economy.

We suggest that the lifeways of the Beothuk's ancestors—the people who camped at Birchy Lake—may have been likewise informed and structured by their neighbors, the Dorset. The Dorset had a significant presence on the coast, especially in places that provided excellent access to harp seals in the spring. And for hundreds of years their presence there might have not mattered much to Amerindian peoples since they could probably find seals elsewhere. If micro-environmental conditions conspired against them (a stiff wind that keeps the ice and seals offshore), or broader environmental changes (the Medieval Climatic Anomaly) narrowed access to harp seals to the prime sealing areas the Dorset occupied, however, Amerindians may have been compelled to turn inland, and to caribou—to a resource and a subsistence strategy with which they were familiar. We think such a turn might explain the springtime hunting of caribou and the intensive reduction of bone for grease in the latter half of the first millennium AD witnessed at Birchy Lake.

Finally, the presence of Amerindians on Birchy Lake may also teach us something about the demise of the Dorset—as well as speak to the broader issue of the social and cultural contexts of adaptation. We know that the Dorset were not very active in the interior during their long tenure on the island, nor do caribou ever appear to have been a vital food resource for them in the way it was for Amerindians. Rather, for centuries the Dorset committed themselves to the coast and to harp seal, and their use of both does not seem to have changed much when warmer weather set in during the latter half of the first millennium AD. There is some evidence that they focused on seabirds and became a bit more mobile (Anstey and Renouf 2011; Hodgetts et al. 2003), but these adjustments seem like minor variations on a coastal theme. There is no indication that the Dorset tried an entirely different approach. They certainly did not start hunting caribou to any considerable degree. Indeed, it could be said that their response to climate change was largely inaction, and thus that the Dorset's failure on the island was of their own making (Holly 2011, 2013:107–8). Path dependence is when societies continue to follow entrenched practices in the face of conditions that call for change, often with tragic consequences (Habu 2008:581; Hegmon et al. 2008; Nelson et al. 2014). And maybe this is what happened to the Dorset. If so, it would suggest that their response to risk and uncertainty (as well as the Amerindians who camped at Birchy Lake) was not narrowly structured by problems posed by the natural environment but by

tradition and social conditions too. In short, "bad years" are not solely the result of Mother Nature—they are made by people as well.

NOTES

This research was made possible by support from Eastern Illinois University and the Research Office of MacEwan University. We'd like to thank the three anonymous reviewers for their thoughtful comments and criticism on an earlier version of this paper. The assistance of Courtney Lawrence, Miranda Perry, and Melissa Blunden in inventorying the faunal collection is also greatly appreciated. Hugh McKenzie and Michael Gillespie offered suggestions for interpreting the radiocarbon dates and associated statistics. Elaine Anton, Derek LeGrow, Shannon and Nadine Lewis, and Steve Hull assisted with our archaeological investigations at Birchy Lake in 2005 and 2007. Steve Hull additionally shared reports and other material. This paper is dedicated to the late great Ken Reynolds, who also worked at Birchy Lake, helped make our work there possible, and long supported the research efforts of archaeologists working in Newfoundland and Labrador through his position in the Provincial Archaeology Office.

1. We have used Paleo-Inuit in place of the traditional term "Paleo-Eskimo" following the recommendation of the Inuit Circumpolar Council (see Friesen 2015). For some discussion of the term "Recent Indian" see Stopp (2008:97–99).

REFERENCES CITED

Anstey, R., and P. Renouf. 2011. "Down the Labrador: Ramah chert use at Phillip's Garden, Port au Choix," in *The cultural landscapes of Port au Choix*. Edited by M. A. P. Renouf, pp. 189–207. New York: Springer.

Armitage, P. 1992. Religious ideology among the Innu of eastern Quebec and Labrador. *Religiologiques* 6:64–110.

Austin, S. 1984. Maritime Archaic and Recent Indian evidence from Cape Cove Beach, Newfoundland. *Canadian Journal of Archaeology* 8:115–26.

Balikci, A. 1970. *The Netsilik Eskimo*. Prospect Heights, IL: Waveland Press.

Barnable, S. 2008. *Rattling Brook 1 (DgBt-1): An examination of Middle Dorset inner bay settlements*. MA thesis, Memorial University of Newfoundland, St. John's.

Bell, T., and P. Renouf. 2003. Prehistoric cultures, reconstructed coasts: Maritime Archaic Indian site distribution in Newfoundland. *World Archaeology* 35:350–70.

———. 2008. The domino effect: Culture change and environmental change in Newfoundland, 1500–100 cal B.P. *The Northern Review* 28:72–94.

Bergerud, A. 1971. The population dynamics of Newfoundland caribou. *Wildlife Monographs* 25:3–55.

———. 1975. The reproductive season of Newfoundland caribou. *Canadian Journal of Zoology* 53:1213–21.

———. 1983. Prey switching in a simple ecosystem. *Scientific American* 249 (6):130–41.

Bergerud, A., and D. Miller. 1977. Population dynamics of Newfoundland beaver. *Canadian Journal of Zoology* 55:1480–92.

Bessire, L. 2014. *Behold the black caiman: A chronicle of Ayoreo life*. Chicago: University of Chicago Press.

Binford, L. 1978. *Nunamiut ethnoarchaeology*. New York: Academic Press.

Bouchard, S. 2006. *Caribou hunter: A song of a vanished Innu life* (trans. by J. Irving). Vancouver: Greystone Books

Brightman, R. 1993. *Grateful prey: Rock Cree human-animal relationships*. University of California Press, Berkeley.

Brink, J. 1997. Fat content in the leg bones of *Bison bison*, and applications to archaeology. *Journal of Archaeological Science* 24:259–74.

Bryan, K. 1950. *Flint quarries—the sources of tools and, at the same time, the factories of the American Indian*. Papers of the Peabody Museum of American Archaeology and Ethnology 17. Cambridge: Peabody Museum of American Archaeology and Ethnology.

Burch, E. Jr. 1972. The caribou/wild reindeer as a human resource. *American Antiquity* 37:339–68.

Cameron, A. 1958. *Mammals of the islands in the Gulf of St. Lawrence*. National Museum of Canada Bulletin No. 154. Ottawa: Queens Printer, Department of Northern Affairs and National Resources.

Cannon, A. 2011. "Introduction," in *Structured worlds: The archaeology of hunter-gatherer thought and action*. Edited by A. Cannon, pp. 1–10. Oakville: Equinox.

Carignan, P. 1977. *Beothuk archaeology in Bonavista Bay*. Archaeological Survey of Canada Paper 69. Ottawa: National Museums of Man.

Church, R., and L. Lyman. 2003. Small fragments make small differences in efficiency when rendering grease from fractured artiodactyl bones by boiling. *Journal of Archaeological Science* 30:1077–84.

Cridland, J. 1998. *Late prehistoric Indian subsistence in northeastern Newfoundland: Faunal analysis of Little Passage complex assemblages from the Beaches and Inspector Island sites*. MA thesis, Memorial University of Newfoundland, St. John's.

Cumbaa, S. 1984. "Divers furres and deeres flesh"—Animal use by a 17th century Beothuk population at Boyd's Cove, Notre Dame Bay, Newfoundland. Report on file, Provincial Archaeology Office of Newfoundland and Labrador, St. John's.

Darwent, C., and L. Lyman. 2002. "Detecting the postburial fragmentation of carpals, tarsals and phalanges," in *Advances in forensic taphonomy: Method, theory and archaeological perspectives*. Edited by W. Haglund and M. Sorg, pp. 356–77. Boca Raton: CRC Press.

Davies, K., ed. 1963. *Northern Quebec and Labrador journals and correspondence, 1819–35*. London: The Hudson's Bay Record Society.

Dodds, D. 1983. "Terrestrial mammals," in *Biogeography and ecology of the Island of Newfoundland*. Edited by G. R. South, pp. 509–50. The Hague: Dr. W. Junk.

Dugmore, A. 1913. *The romance of the Newfoundland caribou: An intimate account of the life of the reindeer of North America*. London: William Heinemann.

Eidlitz, K. 1969. *Food and emergency food in the circumpolar area*. Uppsala: Uppsala University Press.

Enloe, J., and F. David. 1997. "Rangifer herd behavior: Seasonality of hunting in the Magdalenian of the Paris Basin," in *Caribou and reindeer hunters of the northern hemisphere*. Edited by L. Jackson and P. Thacker, pp. 52–68. London: Avebury.

Erwin, J. 2003. Dorset Palaeoeskimo settlement patterns in White Bay, Newfoundland. *Northeast Anthropology* 66:5–14.

———. 2005. "Revisiting the Dorset soapstone quarry in Fleur de Lys, Newfoundland," in *Contributions to the study of the Dorset Palaeo-Eskimos*. Edited by P. Sutherland, pp. 121–31. Gatineau, Quebec: Canadian Museum of Civilization.

———. 2011. "The changing nature and function of Phillip's Garden: A diachronic perspective," in *The cultural landscapes of Port au Choix*. Edited by M. A. P. Renouf, pp. 161–78. New York: Springer.

———. 2016. A large-scale systematic study of Dorset and Groswater soapstone vessel fragments from Newfoundland and Labrador. *Arctic* 69(S1):1–8.

Erwin, J., and D. H. Holly Jr. 2006. Baie Verte waterway project: Birchy Lake survey and reconnaissance 2005. Report on file, Provincial Archaeology Office of Newfoundland and Labrador, St. John's.

Erwin, J. C., D. H. Holly Jr., S. Hull, and T. Rast. 2005. Form and function of projectile points and the trajectory of Newfoundland prehistory. *Canadian Journal of Archaeology* 29:46–67.

Fandén, A. 2005. Ageing the beaver (*Castor fiber* L.): A skeletal development and life history calendar based on epiphyseal fusion. *Archaeofauna* 14:199–213.

Fitzhugh, W. 1980. Preliminary report on the Torngat archaeological project. *Arctic* 33:585–606.

Fogt, L. 1998. *The excavation and analysis of a Dorset Palaeoeskimo dwelling at Cape Ray, Newfoundland*. MA thesis, Memorial University of Newfoundland, St. John's.

Friesen, T.M. 2015. On the naming of Arctic archaeological traditions: The case for Paleo-Inuit. *Arctic* 68:iii–iv.

Gaston, A., and I. Jones. 1998. *The Auks*. Oxford: Oxford University Press.

Gilbert, W. 2002. *Russell's Point (CiAj-1): A Little Passage/Beothuk site at the bottom of Trinity Bay*. MA thesis, Memorial University of Newfoundland, St. John's.

Gordon, B. 1996. *People of sunlight, people of starlight: Barrenland archaeology in the Northwest Territories of Canada*. Hull: Canadian Museum of Civilization.

Gordon, D. 1980. Reflections on refuse: A contemporary example from James Bay, Quebec. *Canadian Journal of Archaeology* 4:83–97.

Graesch, A., T. Dimare, G. Schachner, D. Schaepe, and J. Dallen. 2014. Thermally modified rock: The experimental study of "fire-cracked" byproducts of hot rock cooling. *North American Archaeologist* 35:167–200.

Habu, J. 2008. Growth and decline in complex hunter-gatherer societies: A case study from the Jomon period Sannai Maruyama site, Japan. *Antiquity* 82:571–84.

Halstead, P., and J. O'Shea, eds. 1989a. *Bad year economics: Cultural responses to risk and uncertainty*. Cambridge: Cambridge University Press.

———. 1989b. "Introduction," in *Bad year economics: Cultural responses to risk and uncertainty*. Edited by P. Halstead and J. O'Shea, pp. 1–7. Cambridge: Cambridge University Press.

Hegmon, M., M. Peeples, A. Kinzig, S. Kulow, C. Meegan, and M. Nelson. 2008. Social transformation and its human costs in the prehispanic U.S. Southwest. *American Anthropologist* 110:313–24.

Heinrich, A. 2014. The archaeological signature of stews or grease rendering in the historic period: Experimental chopping of long bones and small fragment sizes. *Advances in Archaeological Practice* 1:1–12.

Henriksen, G. 1973. *Hunters in the barrens*. St. John's: ISER, Memorial University of Newfoundland.

Herrmann, N., and N. Bennett. 1999. The differentiation of traumatic and heat related fractures in burned bone. *Journal of Forensic Sciences* 44:461–69.

Hodgetts, L. 2005. Using bone measurements to determine the season of harp seal hunting at the Dorset Palaeoeskimo site of Phillip's Garden. *Newfoundland and Labrador Studies* 20: 91–106.

Hodgetts, L. M., M. A. P. Renouf, M. S. Murray, D. McCuaig-Balkwill, and L. Hawse. 2003. Changing subsistence practices at the Dorset Paleoeskimo site of Phillip's Garden, Newfoundland. *Arctic Anthropology* 40:106–20.

Holly, D. Jr. 1998. Environment, history and agency in storage adaptation: On the Beothuk in the 18th century. *Canadian Journal of Archaeology* 22:19–30.

———. 2000. The Beothuk on the eve of their extinction. *Arctic Anthropology* 37:79–95.

———. 2002a. Subarctic "prehistory" in the anthropological imagination. *Arctic Anthropology* 39:10–26.

———. 2002b. *From space to place: An archaeology and historical geography of the Recent Indian period in Newfoundland*. Ph.D. Dissertation, Brown University.

———. 2005. The place of "others" in hunter-gatherer intensification. *American Anthropologist* 107:207–20.

———. 2008. Social aspects and implications of "running to the hills": The case of the Beothuk Indians of Newfoundland. *Journal of Island and Coastal Archaeology* 3:170–90.

———. 2011. "When foragers fail: In the Eastern Subarctic, for example," in *Hunter-Gatherer Archaeology as Historical Process*. Edited by K. Sassaman and D. Holly Jr., pp. 79–92. Tucson: The University of Arizona Press.

———. 2013. *History in the making: The archaeology of the Eastern Subarctic*. Lanham, MD: AltaMira.

Holly, D. Jr., and J. Erwin. 2009. Terra incognita still: Archaeological investigations in the interior of the island of Newfoundland. *Archaeology of Eastern North America* 37:65–84.

Holly, D. Jr., C. Wolff, and J. Erwin. 2015. Before and after the fire: Archaeological investigations at a Little Passage/Beothuk encampment in Trinity Bay, Newfoundland. *Canadian Journal of Archaeology* 39:1–31.

Holmes, W., 1919. *Handbook of aboriginal American antiquities*, Part I. Bureau of American Ethnology Bulletin 60. Washington, DC: Government Printing Office.

Honigmann, J. 1956. The Attawapiskat Swampy Cree: An ethnographic reconstruction. *Anthropological Papers of the University of Alaska* 5:23–82.

———. 1964. "Indians of Nouveau-Québec", in *Le Nouveau-Québec: Contribution a l'étude de l'occupation humaine*. Edited by J. Malaurie and J. Rousseau, pp. 315–73. Paris: Mouton.

Hood, B. C. 1998. Theory on ice: The discourse of eastern Canadian Arctic Paleo-Eskimo archaeology. *Acta Borealia* 15(2):3–58.

Jacques Whitford Ltd. 1991. A summary of heritage resource projects in Newfoundland and Labrador in 1989. Report on file, Provincial Archaeology Office of Newfoundland and Labrador, St. John's.

Jenkinson, A., and J-P. Ashini. 2015. Tshikapisk archaeological activities at Kamestastin, spring 2014. *Provincial Archaeology Office 2014 Archaeology Review* 13:92–103. Provincial Archaeology Office of Newfoundland and Labrador, St. John's.

Jin, J., and E. Mills. 2011. Split phalanges from archaeological sites: Evidence of nutritional stress? *Journal of Archaeological Science* 38:1798–1809.

Karr, L., A. Short, L. Hannus, and A. Outram. 2015. A bone grease processing station at the Mitchell prehistoric Indian village: Archaeological evidence for the exploitation of bone fats. *Environmental Archaeology* 20:1–12.

Keeley, L. H., 1996. *War before civilization*. New York: Oxford University Press.

Kristensen, T. 2011. Seasonal bird exploitation by Recent Indian and Beothuk hunter-gatherers of Newfoundland. *Canadian Journal of Archaeology* 35:292–322.

LeBlanc, S. 2003. A Middle Dorset dwelling in Trinity Bay, Newfoundland. *Études/Inuit/Studies* 27:493–513.

Levac, E., 2003. Palynological records from Bay of Islands, Newfoundland: Direct correlation of Holocene paleoceanographic and climate changes. *Palynology* 27:135–54.

Lewis, H., and K. Doutt. 1942. Records of the Atlantic walrus and the polar bear in or near the northern part of the Gulf of St. Lawrence. *Journal of Mammalogy* 23:365–75.

Loring, S. 1988. "Keeping things whole: Nearly two thousand years of Indian (Innu) occupation in Northern Labrador," in *Boreal forest and Sub-Arctic archaeology*. Edited by: C. Reid, pp. 157–82. London, Ontario: Ontario Archaeological Society.

———. 1989. "Tikkoatokak (HdCl-1): A late prehistoric Indian site near Nain," in *Archaeology in Newfoundland and Labrador 1986*. Edited by C. Thomson and J. Thomson, pp. 52–71. St. John's: Newfoundland Museum and Historic Resources Division, Department of Municipal and Provincial Affairs.

———. 1997. "On the trail to the Caribou House: Some reflections on Innu caribou hunters in Northern Ntessinan (Labrador)," in *Caribou and reindeer hunters of the northern hemisphere*. Edited by L. Jackson and P. Thacker, pp. 185–220. London: Avebury.

Lourandos, L. 1997. *Continent of hunter-gatherers*. Cambridge: Cambridge University Press.

Lupo, K., A. J-P. Ndanga, and C. Kiahtipes. 2014. "On Late Holocene population interactions in the northwestern Congo Basin: When, how, and why does the ethnographic pattern begin?" in *Hunter-gatherers of the Congo Basin*. Edited by B. S. Hewlett, pp. 59–83. New Brunswick: Transaction Publishers.

Lytwyn, V. 2002. *Muskekowuck Athinuwick: Original people of the great swampy land*. Winnipeg: University of Manitoba Press.

Madrigal, T., and J. Holt. 2002. White-tailed deer meat and marrow return rates and their application to Eastern Woodlands archaeology. *American Antiquity* 67:745–59.

Mahoney, S., and J. Schaefer. 2002. Long-term changes in demography and migration of Newfoundland caribou. *Journal of Mammology* 83:957–63.

Mansfield, A. W. 1964. *Seals of Arctic and eastern Canada*. Bulletin 137. Ottawa: Fisheries Research Board of Canada.

Marshall, F., and T. Pilgram. 1991. Meat versus within-bone nutrients: Another look at the meaning of body part representation in archaeological sites. *Journal of Archaeological Science* 18:149–63.

Marshall, I. 1981. Disease as a factor in the demise of the Beothuck Indians. *Culture* 1:71–77.

———. 1996. *A history and ethnography of the Beothuk*. Montreal: McGill-Queens University Press.

Milne, S. B., and R. W. Park 2016. "Pre-Dorset culture," in *The Oxford handbook of the prehistoric Arctic*. Edited by T. M. Friesen and O. K. Mason, pp. 693–712. Oxford: Oxford University Press.

Montevecchi, W., and L. M. Tuck 1987. *Newfoundland birds: Exploitation, study, conservation*. Cambridge, MA: The Nuttall Ornithological Club.

Morin, E. 2007. Fat composition and Nunamiut decision-making: A new look at the marrow and bone grease indices. *Journal of Archaeological Science* 34:69–82.

Morrison, D. 1997. *Caribou hunters in the Western Arctic: Zooarchaeology of the Rita-Claire and Bison Skull sites*. Hull: Canadian Museum of Civilization.

Morrison, D., and P. Whitridge. 1997. Estimating the age and sex of caribou from mandibular measurements. *Journal of Archaeological Science* 24:1093–1106.

Morrison, K. D. 2002. "Historicizing adaptation, adapting to history: Forager-traders in South and Southeast Asia," in *Forager-traders in South and Southeast Asia*. Edited by D. Morrison and L. L. Junker, pp. 1–17. Cambridge: Cambridge University Press.

Munro, N. 2004. Zooarchaeological measures of hunting pressure and occupation intensity in the Natufian: Implications for agricultural origins. *Current Anthropology* 45:S5–S33.

Munro, N., and G. Bar-Oz. 2005. Gazelle bone fat processing in the Levantine Epipalaeolithic. *Journal of Archaeological Science* 32:223–39.

Murray, M. 1998. Faunal Report: Dorset Palaeoeskimo component at Peat Garden North site (EgBf-18), Bird Cove, Newfoundland, 1997 field season. Report on file, Provincial Archaeology Office of Newfoundland and Labrador, St. John's.

———. 2011. "Whitecoats, beaters and turners: Dorset Paleoeskimo harp seal hunting from Phillip's Garden, Port au Choix," in *The cultural landscapes of Port au Choix*. Edited by M. A. P. Renouf, pp. 209–26. New York: Springer.

Nagaoka, L. 2006. Prehistoric seal carcass exploitation at the Shag Mouth site, New Zealand. *Journal of Archaeological Science* 33:1474–81.

Nelson, B., A. Chase, and M. Hegmon. 2014. "Transformative relocation in the U.S. Southwest and Mesoamerica," in *The resilience and vulnerability of ancient landscapes*. Edited by A. Chase and V. Scarborough, pp. 171–82. Archeological Papers of the American Anthropological Association 24. Malden, MA: Wiley.

Nielsen, A. E. 2009. "Ancestors of War: Meaningful conflict and social process in the south Andes," in *Warfare in cultural context: Practice, agency, and the archaeology of violence*. Edited by A. Nielsen and W. Walker, pp. 139–64. Tucson, University of Arizona Press.

Outram, A. 2001. A new approach to identifying bone marrow and grease exploitation: Why the "indeterminate" fragments should not be ignored. *Journal of Archaeological Science* 28:401–10.

———. 2003. Comparing level of subsistence stress amongst Norse settlers in Iceland and Greenland using levels of bone fat exploitation as an indicator. *Environmental Archaeology* 8:119–28.

Pasda, K., 2009. *Osteometry and osteological age and sex determination of the Sisimiut reindeer population* (Rangifer tarandus groenlandicus). Oxford: BAR International Series 1947.

Pastore, R. 1989. The collapse of the Beothuk world. *Acadiensis* 19:52–71.

Pike-Tay, A., and C. Morcomb, and M. O'Farrell. 2000. Reconsidering the quadratic crown height method of age estimation for *Rangifer* from archaeological sites. *Archaeozoologia* 11:145–74.

Pintal, J-Y. 1989. Contributions à la préhistoire récente de Blanc-Sablon. *Recherches Amérindiennes au Québec* 19:33–44.

Prince, P. 2007. Determinants and implication of bone grease rendering: A Pacific Northwest example. *North American Archaeologist* 28:1–28.

Reader, D. 1998. Early Recent Indian interior occupation at Deer Lake Beach: Implications for theories of Recent Indian and Beothuk resource use, settlement, and social organization in Newfoundland. *Northeast Anthropology* 55:47–70.

Renouf, M. A. P. 1993. Palaeoeskimo seal hunters at Port au Choix, northwestern Newfoundland. *Newfoundland Studies* 9:185–212.

———. 1994. "Two transitional sites at Port au Choix, Northwestern Newfoundland," in *Threads of Arctic prehistory: Papers in honour of William E. Taylor, Jr.* Edited by D. Morrison and J-L. Pilon, pp. 165–95. Hull: Canadian Museum of Civilization.

———. 1999. Prehistory of Newfoundland hunter-gatherers: Extinctions or adaptations? *World Archaeology* 30:403–20.

———. 2000. "Symbolism and subsistence: Seals and caribou at Port au Choix, northwestern Newfoundland," in *Animal bones, human societies*. Edited by P. Rowley-Conwy, pp. 65–73. Oxford: Oxbow Books.

———. 2003. Hunter-gatherer interactions: Mutualism and resource partitioning on the Island of Newfoundland. *Before Farming* 1(4):1–16.

———. 2011. "On the headland: Dorset seal harvesting at Phillip's Garden, Port au Choix," in *The cultural landscapes of Port au Choix*. Edited by M. A. P. Renouf, pp. 131–60. New York: Springer.

Renouf, M. A. P., and T. Bell. 2009. "Contraction and expansion in Newfoundland prehistory, AD 900–1500," in *The northern world, AD 900–1400*. Edited by H. Maschner, O. Mason, and R. McGhee, pp. 263–78. Salt Lake City: University of Utah Press.

Renouf, M. A. P., T. Bell, and M. Teal. 2000. "Making contact: Recent Indians and PalaeoEskimos on the Island of Newfoundland," in *Identities and cultural contacts in the Arctic*. Edited by M. Appelt, J. Berglund, and H. Gulløv, pp. 106–19. Copenhagen: Danish National Museum and Danish Polar Center.

Reynolds, K. 2002. An archaeological investigation at Birchy Lake and at several locations on the Great Northern Peninsula, June 14th to June 19th, 2002. Report on file, Provincial Archaeology Office of Newfoundland and Labrador, St. John's.

Rival, L. M. 2002. *Trekking through history: The Huaorani of Amazonian Ecuador*. New York: Columbia University Press.

Robbins, D. 1985. *Stock Cove, Trinity Bay: The Dorset Eskimo occupation of Newfoundland from a southeastern perspective*. MA thesis, Memorial University of Newfoundland.

Robertson, R., and A. Shadle. 1954. Osteologic criteria of age in beavers. *Journal of Mammology* 35:197–203.

Rosenberg, S., I. Walker, and J. Macpherson. 2005. Environmental changes at Port au Choix as reconstructed from fossil midges. *Newfoundland and Labrador Studies* 20:57–73.

Rowley-Conwy, P. 1990. Settlement patterns of the Beothuk Indians: A view from away. *Canadian Journal of Archaeology* 14:13–32.

Ryan, K. 2016. "The "Dorset Problem" revisited: The Transitional and Early and Middle Dorset periods in the Eastern Arctic," in *The Oxford handbook of the prehistoric Arctic*. Edited by T. M. Friesen and O. K. Mason, pp. 761–81. Oxford: Oxford University Press.

Saint-Germain, C. 1997. The production of bone broth: A study in nutritional exploitation. *Anthropozoologica* 25–26:153–56.

Sassaman, K., and D. H. Holly Jr. 2011. "Transformative hunter-gatherer archaeology in North America," in *Hunter-gatherer archaeology as historical process*. Edited by K. Sassaman and D. Holly Jr., pp. 1–13. Tucson: University of Arizona Press.

Schwarz, F. 1992. Archaeological investigations in the Exploits Basin. Report on file, Provincial Archaeology Office of Newfoundland and Labrador, St. John's.

———. 1993. Archaeological Investigations at the Bank Site, Terra Nova National Park, Bonavista Bay, Newfoundland. Report on file, Provincial Archaeology Office of Newfoundland and Labrador, St. John's.

———. 1994. Paleo-Eskimo and Recent Indian subsistence and settlement patterns on the Island of Newfoundland. *Northeast Anthropology* 47:55–70.

———. 2011. Stage 1 historic resources impact assessment, proposed cottage lot development areas, Birchy Lake, NL. Report on file, Provincial Archaeology Office of Newfoundland and Labrador, St. John's.

Scott, W. B. and E. J. Crossman. 1973. *Freshwater fishes of Canada*. Bulletin 184. Ottawa: Fisheries Research Board of Canada.

Sergeant, D. 1991. *Harp seals, man and ice*. Ottawa: Department of Fisheries and Oceans.

Sharp, H. S., and K. Sharp. 2015. *Hunting caribou: Subsistence hunting along the northern edge of the boreal forest*. Lincoln: University of Nebraska Press.

Skibo, J. 2015. "The adoption of pottery in the eastern United States: A performance-based approach," in *Explorations in behavioral archaeology*. Edited by W. Walker and J. Skibo, pp. 138–55. Salt Lake City: University of Utah Press.

Solignac, S., A. de Vernal, and C. Hillaire-Marcel. 2004. Holocene sea-surface conditions in the North Atlantic: Contrasted trends and regimes in the western and eastern sectors (Labrador Sea vs. Iceland Basin). *Quaternary Science Reviews* 23:319–34.

Speck, F. 1977 [1935]. *Naskapi: The savage hunters of the Labrador Peninsula*. Norman: University of Oklahoma Press.

Speth, J., and K. Spielmann. 1983. Energy source, protein metabolism, and hunter-gatherer subsistence strategies. *Journal of Anthropological Archaeology* 2:1–31.

Spiess, A. 1979. *Reindeer and caribou hunters: An archaeological study*. New York: Academic Press.

———. 1992. "Archaic period subsistence in New England and the Atlantic Provinces," in *Early Holocene occupation in northern New England*. Edited by Brian S. Robinson, James B. Petersen, and Ann K. Robinson. pp. 163–85. Occasional Publications in Maine Archaeology 9. Augusta: Maine Historic Preservation Commission.

Steele, D. 1983. "Marine ecology and zoogeography," in *Biogeography and ecology of the Island of Newfoundland*. Edited by G. R. South, pp. 421–65. The Hague: Dr. W. Junk.

Stenton, D. 1991. The adaptive significance of caribou winter clothing for Arctic hunter-gatherers. *Études/Inuit/Studies* 15:3–28.

Stewart, A., D. Keith, and J. Scottie. 2004. Caribou crossings and cultural meanings: Placing traditional knowledge and archaeology in context in an Inuit landscape. *Journal of Archaeological Method and Theory* 11:183–211.

Stewart, F. 1971. Faunal analysis of the Indian Point site, Red Indian Lake, NFLD. Report on file, Provincial Archaeology Office of Newfoundland and Labrador, St. John's.

———. 1973. Faunal remains from the Wigwam Brook site (DfAw-1) of Newfoundland. *Bulletin of the Canadian Archaeological Association* 5:91–112.

Stopp, M. 2002. Ethnohistoric analogues for storage as an adaptive strategy in northeastern Subarctic prehistory. *Journal of Anthropological Archaeology* 21:301–28.

———. 2008. FbAx-01: A Daniel Rattle hearth in southern Labrador. *Canadian Journal of Archaeology* 32:96–127.

Symmons, R. 2005. New density data for unfused and fused sheep bones, and a preliminary discussion of the modelling of taphonomic biases in archaeofaunal age profiles. *Journal of Archaeological Science* 32:1691–98.

Tanner, A. 1974. "The hidden feast: Eating and ideology among the Mistassini Cree," in *Papers of the Sixth Algonquian Conference*. Edited by W. Cowan., pp. 291–313. Canadian Ethnology Service Paper 23. Ottawa: National Museums of Canada.

———. 1979. *Bringing home animals*. St. John's: Institute of Social and Economic Research.

Tanner, V. 1947. *Outlines of the geography, life & customs of Newfoundland-Labrador*, vol. 2. Cambridge: Cambridge University Press.

Templeman, W. 1966. *Marine resources of Newfoundland*. Bulletin 154. Ottawa: Fisheries Research Board of Canada.

Tuck, J., and W. Fitzhugh. 1986. "Palaeo-Eskimo traditions of Newfoundland and Labrador: A re-appraisal," in *Palaeo-Eskimo cultures in Newfoundland, Labrador and Ungava*. Pp. 161–67. Reports in Archaeology 1. St. John's: Memorial University of Newfoundland.

Tuck, J., and R. Pastore. 1985. A nice place to visit, but . . .—Prehistoric human extinctions on the Island of Newfoundland. *Canadian Journal of Archaeology* 9:69–80.

Turner, L. 2001 [1894]. *Ethnology of the Ungava district, Hudson Bay Territory*. Washington, DC: Smithsonian Institution Press.

Ugan, A. 2005. Climate, bone density, and resource depression: What is driving variation in large and small game in Fremont archaeofaunas? *Journal of Anthropological Archaeology* 24:227–51.

Vehik, S. 1977. Bone fragments and bone grease manufacturing: A review of their archaeological use and potential. *Plains Anthropologist* 22:169–82.

Warren, G. 2005. *Mesolithic lives in Scotland*. Stroud: Tempus.

Waterhouse, K. 2013. Post-burning fragmentation of calcined bone: Implications for remains recovery from fatal fire scenes. *Journal of Forensic and Legal Medicine* 20:1112–17.

Wells, P., P. Renouf, F. Dussault, J. Miszaniec, D. Lavers, and C. Robinson. 2014. Archaeological investigations at Phillip's Garden, 2013: A program to recover chronological, entomological, and fuel charcoal data. *Provincial Archaeology Office 2013 Archaeology Review* 12: 166–75. St. John's: Provincial Archaeology Office of Newfoundland and Labrador.

Westman, C. 2015. The Wihkohtowin: Ritual feasting among Cree and Métis peoples in northern Alberta. *Anthropologica* 57:299–314.

Wolff, C., J. Erwin, T. Nomokonova, and D. Holly Jr. 2010. Preliminary analyses of Dorset Paleoeskimo subsistence at the Stock Cove Site (CkAl-3), Trinity Bay, Newfoundland. *North Atlantic Archaeology* 2:125–34.

Wolff, C., D. Holly Jr., F. Dussault, A. Couture, and T. Testa. 2014. Caught somewhere in time: Continuing investigation of the Stock Cove site (CkAl-3). *Provincial Archaeology Office 2013 Archaeology Review* 12:184–190. St. John's: Provincial Archaeology Office of Newfoundland and Labrador.

Wolverton, S., L. Nagaoka, J. Densmore, and B. Fullerton. 2008. White-tailed deer harvest pressure and within-bone nutrient exploitation during mid- to late Holocene in southeast Texas. *Before Farming* 2:1–23.