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The Seasonal Nutrient Density of Country Food Harvested in Makkovik, Labrador

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ABSTRACT. The contribution of country food to the diets of residents of Makkovik, Labrador, reflects the seasonal availability of different species on the northern Labrador coast. The nutrient density of the wild food component of the food supply varies from season to season according to the relative contribution of the various species harvested. In the summer, the level of calcium is somewhat higher than in most other seasons, reflecting the large contribution of fish. In early fall, the nutrient density for iron is the lowest for all seasons, and the level of calcium decreases to about half that of summer. In late fall, the nutrient density of the country food harvested for household use has the highest density of thiamin, reflecting the contribution from the migratory birds, and the second highest density of iron, reflecting the increase in percentage contribution of seals. In winter the iron density is approximately twice that of other seasons. The level of calcium increases, reflecting the contribution from partridge and ptarmigan. In early spring the large contribution of caribou provides a high protein content, while for riboflavin it is the highest of any season. In late spring the nutrient density reflects the large percentage of fish. Dietary patterns of a population depending on country food for much of its food supply change from one season to another, and nutrient intakes also vary from season to season. These factors must be considered when evaluating dietary intakes and making nutritional inferences.

Key words: *country food, nutrient density, nutrition,* Subarctic, Labrador

RÉSUMÉ. La contribution des denrées locales au régime alimentaire des habitants de Makkovik, au Labrador, reflète la disponibilité saisonnière de différentes espèces animales sur la côte nord du Labrador. La composition nutritive de la partie de l'alimentation qui vient du gibier varie suivant les saisons selon la contribution relative des différentes espèces chassées ou pêchées. En été, le niveau de calcium est un peu plus élevé que pendant les autres saisons, ce qui reflète l'importance de la contribution du poisson. Au début de l'automne, la concentration en fer est à son plus bas niveau dans toute l'année, et le niveau de calcium descend à environ la moitié de sa valeur estivale. À la fin de l'automne, la composition nutritive des denrées locales récoltées pour la consommation familiale a la plus grande concentration en thiamine (ce qui reflète la contribution des oiseaux migrateurs), et la deuxième plus importante concentration en fer (ce qui traduit l'augmentation de la contribution relative du phoque). En hiver, la concentration en fer est environ deux fois plus forte que durant les autres saisons. Le niveau de calcium augmente en raison de la contribution de la perdrix et du lagopède. Au début du printemps, l'importante contribution du caribou donne une forte teneur en protéines, tandis que la concentration en riboflavine est à son plus haut. À la fin du printemps, la composition nutritive reflète la proportion importante du poisson. Le mode d'alimentation d'une population qui dépend des denrées locales pour la plupart de son approvisionnement varie avec les saisons; l'apport d'éléments nutritifs varie donc avec les saisons. Il faut tenir compte des ces facteurs quand on évalue l'apport d'éléments nutritifs, et quand on en tire des conclusions sur la nutrition.

Mot clés: denrées locales, composition nutritive, nutrition, subarctique, Labrador

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INTRODUCTION

Native and settler inhabitants of the Labrador coast have for generations relied upon the harvesting of wildlife from the land and the sea for much of their food supply. They concentrate their harvesting activities on the species most readily available in any season. The people of the Labrador coast prefer to consume game when it is "fresh," soon after it has been hunted, fished or gathered. Thus, the country food contribution to the diets of coastal residents reflects the seasonal availability of different species on the Labrador coast. Caribou is the only exception to this trend. Although the major caribou harvests are in early spring, much caribou is frozen and utilized throughout the rest of the year. The nutrient density of the wild food component of the food supply varies from season to season according to the relative contribution of the various species harvested. The present study was conducted to determine such variation.

METHODOLOGY

The data from this study refer to a one-year food cycle, lasting from July 1980 to June 1981, and reflect the biological, economic, climatic and social conditions that prevailed during the research period and should be interpreted as such. A detailed description of the methodology of determining the country food use has been previously described (Alton Mackey and Orr, 1987).

The nutrient density of the seasonal country food was calculated per 500 kj for protein, calcium, iron, niacin, thiamine and riboflavin from data on the nutritive value of wild food found in the literature (Botta *et al.*, 1982; Farmer *et al.*, 1971; Hoppner, *et al.*, 1978; Mann *et al.*, 1962; Heller and Scott, 1967; Health and Welfare Canada, 1985). Other nutrients thought to be present in significant quantities have not been included because of insufficient data available for a number of species. Data from the Canadian Nutrient File were used to calculate the nutrient density of the imported food (Health and Welfare Canada, 1987).

COMMUNITY PROFILE

Makkovik is a small community in northern coastal Labrador, founded in 1896 by the Moravian Church. In 1981 the community consisted of 347 people.

For the purpose of this study, a community census was compiled in July 1980 and indicated a total of 333 residents. The 61 households participating in the project represented 295 people. Thus 89% of Makkovik's residents were included in the households contributing data to the food study. Participating households ranged in size from one person to twelve people.

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RESULTS AND DISCUSSION

Each season brings a variety of animal species to the region to feed, breed or rest while on migration, and the people orient their hunting activities and consumption of game to these seasonal changes. Residents recognize six seasons in the year: summer, early fall, late fall, winter, early spring and late spring. Each season is characterized by the availability of certain species of wildlife and by climatic conditions that are important to hunting and gathering activities.

During the study year, from 2 July 1980 to 30 June 1981, Makkovik households harvested a total of 28 398 kg of mammals, fish and birds and 832 kg of berries from their environment for household food use. The seasonal wild food harvest is summarized in Table 1. The nutrient density of the country food harvested is reported by season in Table 2.

Summer

Summer begins in late June or early July, when winter land-fast ice breaks up along the coast and open water in inshore areas attracts various species of fish, birds, seals, porpoise and dolphins. The summer season, restricted to July and August, is the time when households are intensively involved in the cod, salmon and char fisheries, from which most families derive the bulk of their annual income.

TABLE 1. Seasonal weight of species harvested at Makkovik, 2 July 1980-30 June 1981

		Summer		Early fall		Late fall		Winter		Early spring		Late spring		
		kg	%	kg	%	kg	%	kg	%	kg	%	kg	%	Totals
Fish														
Atlantic cod	*Gadus morchua*, Linnaeus	1,278		1,043		443		60		35		4		2,863
Rock cod	*Gadus ogac*, Richardson	27		8		5		900		555		35		1,530
Salmon	*Salmo salar*, Linnaeus	682		173		24		38		22		91		1,030
Char/trout	*Salvelinus alpinus*, Linnaeus *Salvelinus fontinalis*, Mitchell	758		83		79		33		201		1,676		2,830
Other[2]		65		141		19		25		2		69		321
Total fish		2,810	81	1,448	41	570	17	1,056	25	815	87	1,875	87	8,574
Shellfish[3]		24	1	—		23	1	—		6		11		64
Seals														
Jar	*Pusa hispida*, Schreber	18		66		475		1,533		415		179		2,686
Harp	*Pagophilus groenlandica*, Gray	5		—		36		131		40		30		242
Ranger	*Phoca vitulina*, Linnaeus	105		64		5		3		—		34		211
Other[4]		—		4		21		4		—		1		30
Total seals		128	4	134	4	537	16	1,671	40	455	4	244	11	3,169
Dolphins/ Porpoises[5]		144	4	79	2	—		—		2		—		225
Land mammals														
Caribou	*Rangifer tarandus*, Linnaeus	267		54		142		347		10,129		21		10,960
Hare	*Lepus americanus*, Erxleben *Lepus arcticus*, Miller	—		7		33		25		1		—		65
Other[6]		2		—		—		2		—		—		4
Total land mammals		269	8	61	2	175	5	374	9	10,130	86	21	—	11,029
Birds														
Canada geese	*Branta canadensis*, Linnaeus	—		721		14		4		9		9		753
Black duck	*Anas rubripes*, Brewster	31		66		365		44		15		7		523
Eider duck	*Somateria mollissima*, Linnaeus *Somateria spectabilis*, Linnaeus	7		402		1,217		136		109		26		1,897
Scoters	*Melanitta nigra*, Linnaeus *Melanitta deglandi*, Bonaparte *Melanitta perspicillata*, Linnaeus	35		214		16		—		1		—		265
Guillemots	*Ceppus grylle*, Linnaeus	—		192		41		—		—		—		233
Ptarmigan	*Lagopus lagopus*, Linnaeus *Lagopus mutus*, Montin	—		37		259		933		199		5		1,433
Spruce grouse	*Canachites canadensis*, Linnaeus													
Other[7]		3		155		59		2		7		—		226
Total birds		76	2	1,787	51	1,971	60	1,119	27	340	3	43	2	5,336
Total		3,451		3,509		3,276		4,220		11,748		2,195		28,398

[1]All data collected in pounds are converted to kilograms.

[2]Other fish include capelin (*Mallotus villosus*, Muller), smelt (*Osmerus* sp., Mitchell), Atlantic herring (*Clupea harengus*, Linnaeus), sculpin (Family) (*Cottidae*, Linnaeus), lake whitefish (*Coregonus clupeaformis*, Mitchell), Greenland turbot (Reinhardtius hippoglossoides, Walbaum), redfish (*Sebastes* sp., Linnaeus), flounder (winter) (*Pseudopleuronectes americanus*, Walbaum), Atlantic mackerel (*Scomber scombrus*, Linnaeus), squid (*Illex illecebrosus*).

[3]Shellfish include shrimp (*Pandalus borealis*), scallop (*Chlamys islandicus*), clam (*Mya arenaria*), mussel (*Mytilus edulis*).

[4]Other seals include square flipper (bearded) (*Erignathus barbatus*, Gill), grey (*Halichoerus grypus*, Nilsson).

[5]Dolphin include white-beaked (*Lagenorhynchus albirostris*, Gray), white-sided (*Lagenorhynchus acutus*, Gray).

[6]Other land mammals include black bear (*Ursus americanus*, Pallas), beaver (*Castor canadensis*, Kuhl), lynx (*Felis Lynx*, Kerr), porcupine (*Erethizon dorsatum*, Cuvier).

[7]Other birds include turrs (tinkers, murre), (thick-billed) (*Uria lomvia*, Linnaeus); (common) (*Uria aalge*, Pontoppidan); (razorbill) (*Alca torda*, Linnaeus); bullbird (dovekie) (*Plautus alle*, Linnaeus); goldeneye (common) (*Bucephala clangula*, Linnaeus); (Barrow's) (*Bucephala islandica*, Gmelin); merganser (common) (*Mergus merganser*, Linnaeus); (red-breasted) (*Mergus serrator*, Linnaeus); (hooded) (*Lophodytes cucullatus*, Linnaeus); teal (blue-winged) (*Anas discors*, Linnaeus); (green-winged) (*Anas crecca*, Linnaeus), harlequin duck (*Histrionicus histrionicus*, Linnaeus); loon (common) (*Gavia immer*, Brunnich); (wobby, red-throated) (*Gavia stellata*, Pontoppidan); oldsquaw (*Clangula hyemalis*, Linnaeus); widgeon (American) (*Anas americana*, Gmelin); snowy owl (*Nyctea scandiaca*, Linnaeus).

TABLE 2. Nutrient density (per 500 kj) of country food harvested by season at Makkovik, Labrador, July 1980-June 1981

	Summer	Early fall	Late fall	Winter	Early spring	Late spring
Protein (g)	19.3	20.9	21.0	19.9	25.1	19.9
Calcium (mg)	25.7	14.2	12.1	82.2	20.4	20.4
Iron (mg)	2.2	1.3	3.2	6.2	2.8	2.1
Niacin (NE)	6.0	7.9	7.9	7.2	7.8	7.6
Thiamin (mg)	.06	.05	.20	.07	.07	.07
Riboflavin (mg)	.09	.12	.19	.27	.45	.39

During the summer, Makkovik residents procured 12% of their total harvest of country food for household food use (Table 1). Fish provided 81% of the food, with Atlantic cod (*Gadus morhua*, Linnaeus), Arctic char (*Salvelinus alpinus*, Linnaeus), trout (*Savelinus fontinalis*, Mitchell) and salmon (*Salmo salar*, Linnaeus) providing the largest harvests. Ranger seal (*Phoca vitulina*, Linnaeus) was the dominant species of seal caught during the summer. Seals and dolphins/porpoises each provided 4% and caribou (*Rangifer tarandus*, Linnaeus) contributed 8% of the wild food recorded.

The nutrient density of the country food harvested in the summer (Table 2) shows a somewhat higher level of calcium than in most other seasons, reflecting the large contribution of fish. The contribution of calcium from fish is 6-8 times greater than from beef, pork or processed meats and 2-3 times greater than chicken (Table 3). The protein content of the country food available in the summer is twice as much as beef, pork or processed meats. Seals, birds and caribou contributed to the density of iron in the wild food harvested in the summer.

Early Fall

The onset of cool temperatures in September, which causes interior lakes to freeze over by October, marks the early fall season. Migratory birds constitute 51% of the total recorded wild food harvested in early fall. Ducks, geese and other migratory birds gather in large flocks and are intensively hunted as they travel southward. The most important species are Canada geese (*Branta canadensis*, Linnaeus), eider ducks (*Somateria mollissima*, Linnaeus, and *Somateria spectabilis*, Linnaeus), scoters (*Melanitta nigra*, Linnaeus, *Melanitta deglandi*, Bonaparte, and *Melanitta perspicillata*, Linnaeus), guillemots (*Cepphus grylle*, Linnaeus) and black ducks (*Anas rubripes*, Brewster). Cod fishing continues into early fall and harvests are almost as large as those made during the summer. Seals provide 4% and dolphins 2% of the food gathered for household use.

TABLE 3. Nutrient density (per 500 kj) of selected imported meats available in Makkovik, Labrador

	Beef[1]	Chicken[2]	Bologna	Pork chops	Luncheon meat
Protein (g)	9.0	18.0	5.0	8.0	6.0
Calcium (mg)	4.0	10.0	5.0	4.0	3.0
Iron (mg)	1.1	0.8	0.5	1.1	0.9
Niacin (NE)	3.4	9.3	1.7	3.3	2.0
Thiamin (mg)	0.02	0.04	0.05	0.29	0.13
Riboflavin (mg)	0.07	0.11	0.05	0.09	0.09

[1]Values for beef are from beef rump, as this was the most available cut.
[2]Values for chicken are for the whole chicken.

The nutrient density of wild foods reported in early fall are given in Table 2. Nutrient density for iron is the lowest for all seasons but is still greater than for imported foods available in the local store. The nutrient density for calcium is approximately half that of summer but 3-5 times greater than that in beef, pork or processed meats and 1½ times greater than in chicken (Table 3). The protein content is 2-4 times greater in the wild food than in beef, pork or processed meats and twice as high as in chicken.

Late Fall

In late fall, November and December, land-fast ice begins to form in inshore areas, and hunters generally focus their attention on migratory birds and on jar (*Pusa hispida*, Schreber) and harp (*Pagophilus groenlandica*, Gray) seals that travel in herds south along the coast to ice-free waters. Other species of seal, such as bearded (*Erignathus barbatus*, Gill) and grey (*Halichoerus grypus*, Nilsson) seals are also harvested at this time.

In late fall, 60% of the total food reported was from migratory birds, with eider ducks (*Somateria mollissima*, Linnaeus, and *Somateria spectabilis*, Linnaeus) constituting the largest volume. Jar seals (*Pusa hispida*, Schreber) and Atlantic cod (*Gadus morhua*, Linnaeus) made a major contribution to the country food larders of the residents of Makkovik.

The nutrient density of the country food harvested in late fall provides the highest density of thiamin and the second highest density of iron for wild foods in all seasons. The increase in thiamin is associated with the increase in percentage contribution of migratory birds and the increase in iron with the increase in percentage contribution of seals. The nutrient density of the country food was higher for protein, calcium, iron, niacin and riboflavin than all meats in the imported meat supply.

Winter

Freeze-up, or the formation of a sheet of land-fast ice extending seaward, usually occurs in late December and marks the beginning of winter. Severe weather conditions, heavy snowfalls and intense cold last from January to March and, for the most part, restrict hunting activity.

The major winter activity in Makkovik is seal hunting. Seals provided 40% of the total recorded harvest during this season. Jar seal (*Pusa hispida*, Schreber) was the major species harvested, contributing 91% of the total amount of seals reported. Jar seals are hunted in patches of open water or at breathing holes they maintain in winter ice. Fishing is also an important winter activity, providing 25% of the total wild food recorded. Rock cod (*Gadus ogac*, Richardson) are fished through the ice and contributed 85% of all fish reported. Birds provided 27% of the wild food recorded. The main bird harvested in winter is partridge (*Lagopus lagopus*, Linnaeus, *Lagopus mutus*, Montin, and *Canachites canadensis*, Linnaeus). The quantity of partridge, ptarmigan willow (*Lagopus lagopus*, Linnaeus), ptarmigan rock (*Lagopus mutus*, Montin), spruce grouse (*Canachites canadensis*, Linnaeus) caught in winter is the largest harvest for partridge of the year. Some caribou (*Rangifer tarandus*, Linnaeus) and rabbit, Arctic hare (*Lepus arcticus*, Miller) and snowshoe (*Lepus americanus*, Erxleben) were also consumed in winter.

The nutrient density of wild food (Table 2) reported in winter reflects the contribution of seals. The iron density is approxi-

mately twice that recorded in other seasons. The density of riboflavin is also greater than in all other seasons except early spring and late spring. The density of calcium was 82.2 mg·500 kj^{-1}, the highest for any season. The iron density was 5.5 times as high as the best imported meats and the calcium content 10 times as great. Chicken contains more niacin than the wild food composite for winter.

Early Spring

Warm temperatures in April and May mark the early spring season. In early spring, most of the caribou meat consumed during the year by Makkovik residents is taken in early spring hunts. The Labrador Ungava caribou herd migrates from the northwest to feed on the interior barrens, north, west and south of Nain. This herd is accessible to Makkovik hunters at this time of year. During the survey year, 10 129 kg of caribou (*Rangifer tarandus*, Linnaeus) was recorded by participating households during early spring, with 8182 kg reported during a three-week period, 1 April-22 April 1981.

Other important species harvested in early spring are rock cod (*Gadus ogac*, Richardson), jar seals (*Pusa hispida*, Schreber), partridge, ptarmigan willow (*Lagopus lagopus*, Linnaeus), ptarmigan rock (*Lagopus mutus*, Montin), spruce grouse (*Canachites canadensis*, Linnaeus) and eider duck (common, *Somateria mollissima*, Linnaeus; king, *Somateria spectabilis*, Linnaeus).

The nutrient density of the wild food harvested in early spring reflects the large percentage of caribou (*Rangifer tarandus*, Linnaeus). The protein content is high, at 25.1 g·500 kg^{-1}. The density of riboflavin is the highest of any season, reflecting the nutrient density of caribou, seal and partridge. The density of calcium reflects the density of calcium in caribou as well as partridge. The nutrient density of the wild food was greater than imported meats for protein, calcium, iron and riboflavin. Pork chops had a higher nutrient density for thiamine and chicken had more niacin than the wild food composite.

Late Spring

As the ice begins to break up in late spring, Arctic char (*Salvelinus alpinus*, Linnaeus) migrate from the ponds to the heads of bays, where they are plentiful and easily fished, and at this time the largest seasonal harvest of the year is taken for household consumption. The catch of Arctic char amounted to 89% of the total harvest of all species of fish and 76% of the total recorded harvest of wild food in late spring. Seal hunting contributed 11% of the wild food to household resources. There were occasional catches of various migratory birds and a small volume of caribou.

The nutrient density of the late spring harvest reflects the large percentage of fish. The density of calcium is high, with 20.4 mg·500 kj^{-1}. The iron content remains high, at 2.1 mg·500 kj^{-1}, although it was second lowest of any season because of the contribution of seal. The density of riboflavin is also high because of the amount of Arctic char harvested. The nutrient density of the wild food was higher than the imported meats for protein, calcium, iron and riboflavin. Chicken contained more niacin and pork chops have a higher density of thiamin than the wild food composite harvested in the late spring.

SUMMARY AND CONCLUSION

The nutrient density of wild food varies from season to season, depending on the percentage contribution of various species to the country food larder. Thus, it is important to understand the seasonal availability of indigenous food products when evaluating the food supply of a population, which depends to a large extent on hunting, fishing and gathering for its food supply. Dietary patterns in one season are not reflective of dietary patterns in another season, and nutrient intakes also vary from season to season. In all seasons the protein content of the wild food composite is higher than the imported meats available in the local store. The highest nutrient density for protein was in the early spring, reflecting the contribution of caribou. The calcium density was highest in winter and summer. Wild food had a higher calcium density in all seasons than the imported meats. The density of iron reflected the contribution of seal to the wild food composite. The highest densities were during the winter and late fall. The density of iron in the wild food source was greater than the imported meats for all seasons. It was 5.5 times higher in the winter season. Chicken had a higher density of niacin than the wild food composite for any season; however, wild food had more niacin than the other imported meats available in the community. Pork chops contain more thiamin than the wild food composites for any season. Thiamin from wild food was three times higher in late fall than in any other season. Riboflavin was higher in wild food than imported meats for all seasons except summer. It is essential to understand the cyclical nature of traditional food patterns when one is assessing dietary intakes, making nutritional inferences, designing nutrition-related information or intervention programs for a population using country food as a substantial contribution to their diet.

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