NUTRITION RESEARCH, Vol. 4, pp. 789-809, 1984
0271-5317/84 $3.00 + .00 Printed in the USA.

TRADITIONAL AND CONTEMPORARY NUXALK FOODS

Harriet V. Kuhnlein, Ph.D., R.D.

Division of Human Nutrition, School of Family and Nutritional Sciences,
University of British Columbia, Vancouver, B.C. Canada V6T 1W5

ABSTRACT

It is generally thought that the improvement of nutritional status of native people in North America should be accomplished with maximum utilization of locally-available foods traditional to their culture. Prior to initiating a program to enhance food use by the people of the Nuxalk Nation of coastal British Columbia, this research was carried out on the traditional and contemporary Nuxalk foods. The array of foods reported by elderly Nuxalk people to be used in former times is given with Nuxalk names, common names and scientific notation, as well as with seasonal availability and frequency of use. Household interviews were used to document contemporary patterns of use of both traditional and marketed foods for reserve-resident (RR) and urban-resident (UR) families. In general, traditional food use was greater for RR than for UR families, with more fish and berries being used than foods in other categories. Nutrient analysis of one-day summer dietary recalls of young adult RR women revealed low intakes by many for folate, calcium, vitamins E and D, ascorbate, iron and copper. It was concluded that nutrient-rich traditional foods could be utilized to improve Nuxalk diets.

KEY WORDS: Native Indian, Nuxalk, indigenous foods, nutritional status

INTRODUCTION

Native people are among the least advantaged peoples on the continent of North America for the amenities of modern life. Although there are abundant foods with high nutritional value available in North American markets, nutritional fitness of a majority of native Indian families is not evident. Health conditions are known to be poor, and problems with dietary intake and nutritional status have been documented for many Indian groups (1-5, among others). In Canada, dietary patterns and dietary quality have been reported to vary with location and exposure to commercial goods (6,7).

The extent of cultural assimilation into the larger society by native peoples is variable. In reserved areas, especially, segments of native societies are tenaciously retaining the more valued aspects of traditional life-styles. As part of cultural education programs, knowledge about the use of traditional foods is being formally recorded and passed to younger generations by several British Columbian native groups (8,9). In large part, this effort results from the opinion of native leaders that utilization of more locally-available traditional foods would help to relieve family economic pressures while stimulating cultural morale and pride in their traditions.

Native people who have migrated from reserved lands into urban areas are expected to have more exposure to marketed foods, and less access to foods from their traditional land base, unless they receive such food from family or when visiting the home area. Nutritional status and health of urban-resident native people are thought to depend on economic success; however, there is no documentation on these conditions comparing urban-residents to reserve-residents for the same group.

The high nutritional quality of traditional indigenous diets, especially when compared to diets of marketed foods adopted in low-income areas, has been extolled by many scientists (10-16, among others). However, to date, there has been no documentation on the effect of efforts to encourage native people to increase their use of locally-available foods formerly used by their cultural group. Effective programs for increasing the use of traditional foods by native people must take into account the nutritional composition of the foods and how these can best compliment the use of available marketed products. The presence of potential toxins in wild plant foods should be evaluated before these foods are promoted for extensive use. Further, acceptability of the foods to the contemporary group must be considered, as well as their actual availability to families.

A program to enhance food use and nutritional status by emphasizing traditional food resources is being conducted with the people of the Nuxalk Nation of Bella Coola, British Columbia from 1983-1986. The purpose of the research reported here was identification of the traditional foods used by the Nuxalk in former times, with their seasonal availability and relative frequencies of use. Also reported here are contemporary foods used by reserve-resident (RR) and urban-resident (UR) Nuxalk people during summer months, the current yearly use of traditional native foods by both groups, and the nutrient contents of summer dietary recalls reported by RR Nuxalk women. These results provide necessary information for planning the Nuxalk food and nutrition program.

NUTRITIONAL ENVIRONMENT OF THE NUXALK NATION

The people of the Nuxalk Nation are currently living on a reserve of approximately 25 km^2, which is located adjacent to the village of Bella Coola at the mouth of the Bella Coola River on the eastern end of Burke Channel, a deep sea inlet (Figure 1). In former times the population now known as the Nuxalk people occupied many villages along the entire length of the Bella Coola river, as well as several other villages in South Bentinck inlet and the Dean Channel. In 1921-22 McIlwraith (17) recorded knowledge of 45 former villages in these areas, and an estimated former population

"within the thousands" in the Bella Coola Valley alone. Today there are about 675 persons living in 125 households on the reserve and another 200, or so, inhabitants in the Bella Coola Valley and in urban areas of British Columbia. At the time of McIlwraith's work, about 300 Nuxalk people lived in a single village on the north side of the river's mouth, having been resettled there from all surrounding villages after debilitations from smallpox, tuberculosis, measles, and other diseases introduced by white contact (17).

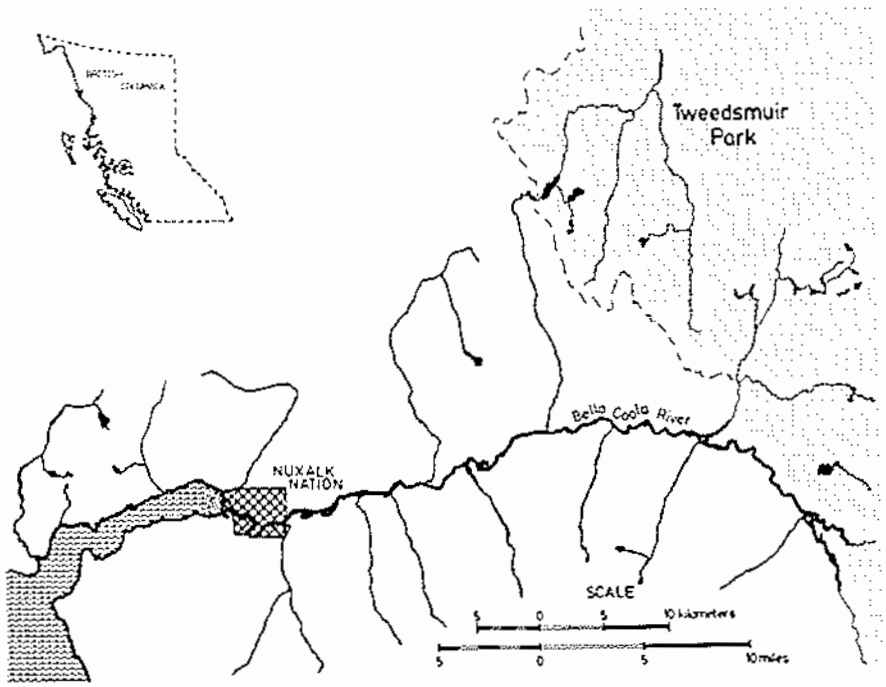

FIG. 1
The Nuxalk Area in British Columbia

The Bella Coola Valley is 130 km east of the open Pacific. It is approximately 60 km from the mouth of the river to the valley head, and about 4 km at the widest part. The valley maintains an inner coastal climate with approximately 165 cm of precipitation annually, although more rainfall occurs at the shoreline than in the upper reaches of the valley. The months with the greatest precipitation are usually October through December (mean of 264 mm/month in 1978). There are about 250 frost-free days per year, with the lowest temperatures occurring in January and the highest in July and August. In some parts of the valley, high mountains (about 2,000 m) cause constant shadow for several of the winter months. In 1978, the average low and high temperatures in January and July were: -7°C and -1.5°C and 9°C and 25°C (24).

The traditional Nuxalk diet emphasized fish, berries, roots and marine fats which were harvested, prepared and preserved with native technologies that were often ingenious (17,20,22). There was no agriculture, per se, practiced by the Nuxalk people for their traditional food items, but some root foods (especially clover and silverweed roots) were carefully tended in their natural habitats to enhance production (21). The Bella Coola River was, and continues to be, a major source of traditional foods with the five species of migrating salmonids, as well as the fat-rich ooligans **(Thaleichtys pacificus)**, readily available for netting. Berries were always abundant in Nuxalk areas, with the best harvesting areas for many of the favorite species known to occur in "clearings" created by fire or logging (personal communication, Nuxalk elders). Use of the inner bark of black cottonwood and western hemlock trees **(Populus trichocarpa** and **Tsuga heterophylla)** for food was documented by MacKenzie (23) when he passed through the Bella Coola Valley in 1793 on his pioneering overland trip from Montreal to the Pacific. The local food supply was described by both MacKenzie and McIlwraith (17,23) as being plentifully abundant to support the population.

Today the effective environmental resources for the traditional food items of the Nuxalk people are in the reserve area, including the river, and the sea. Access by Nuxalk people to food areas on reserve lands is guaranteed, but foods available in other parts of the valley have become more limited in the last few decades, and are affected by trespassing restrictions on private property and the availability of transportion, roads or trails. A large part of the reserve area located on the northside of the river is currently not accessible to all, because of the necessity to use a boat to cross the river, and the lack of cleared foot trails in the dense "bush". In spite of these deterrents, many people continue to harvest traditional foods, especially fish foods and many species of berries.

The concerns of public health personnel for good nutrition and health of the Nuxalk people are similar to those for all of Western Canadian native people (25), but to date, there has been very little documentation of health conditions specific to the Nuxalk Nation. Census data for the reserve reveal that of the population over 15 years of age, only about half (52% in 1976) have attained a grade nine education. There is a reported unemployment rate of about 16%, which is likely to be an underestimate of actual employment seekers. An average family income of $5,390 was noted in comparison to the province-wide figure of $10,019 at that time (1971). In 1976 an average of 5.3 persons were reported to live in private dwellings, most with two rooms (26,27). Generally recognized health problems on the reserve that have direct nutritional implications are obesity, diabetes, high risk infants and alcoholism (personal communication, Sandy Moody, Community Health Nurse on the reserve). Data on the poor state of dental health of Indian children examined in Bella Coola were reported in 1980 (28).

In addition to the traditional foods available in the Nuxalk environment, there is an array of marketed foods available in two food stores which serve a total valley population of about 2000. The primary center for food shopping is the Co-op in Bella Coola, which has been in operation since the mid-1960's. The first foods imported into the Nuxalk area were molasses, flour, tea, sugar, salt and whiskey which were brought by boat beginning about 1850. Later, the Hudson's Bay Company and a series of general stores operated by the fish canneries supplied staple foods to the area (personal communication, Nuxalk elders). Today, fresh foods in the markets are limited in supply, depending on the season and time of week. There is one weekly

delivery of supplies to the Co-op via the 480 km of primarily unpaved road from the city of Williams Lake. In addition, there is a minor supply of fresh eggs, chicken, beef and milk from valley farmers. Frozen, canned, and packaged foods with stable shelf life are readily available.

METHODS

Data on use of traditional and contemporary foods were gathered by holding group discussions with older members of the Nuxalk Nation and by an interview study of all Nuxalk households in 1981-1982. All interested "elders" of the band were invited to participate in the group discussions, and these were tape recorded and transcribed. Questions were asked to elicit a complete list of the locally-available native foods used in their earlier years, and to rank each food for frequency of use in family diets. In all, five group sessions (approximately 9 hours) were needed. Scientific names corresponding to Nuxalk names or common names related by the elders were taken from published literature (17-19, 29-32). In July and August, 1981, interviews were completed to document the extent of use of traditional native foods by reserve-resident (RR) and urban-resident (UR) families. The interview schedule was designed in accordance with procedures established by the UBC Committee for Research and Other Studies Involving Human Subjects, after support was gained from the Band Council, the community health nurse, and the community health representative on the reserve. Interview questions were pretested with six native women in the Vancouver area before the final interview schedule was drafted. Interviews were conducted by one of two trained Nuxalk interviewers in each home with the individual primarily responsible for food procurement, usually a woman homemaker. A quantitative 24-hour dietary recall using portion-sized food models, cups, bowls and measuring spoons to assist memory was taken on the interviewee. If other family members were present, a record of foods eaten in the last 24-hours was also requested of them. The age/sex category with the greatest numbers (i.e., women, age 19-49) was used for nutrient interpretation of diets.

Of the 125 native households in the reserve area, 16 households had no one at home during the interview period because of the commercial fishing season or vacation time. Of the 109 families contacted, 69% agreed to participate in the interview, and this represented about 340 people. Nuxalk families were also contacted who were known to live in three urban areas of British Columbia: Williams Lake, the Greater Vancouver Regional District, and Victoria. Of the 36 families whose addresses were known, 29 successful contacts were made, and of these, 20 families agreed to participate, representing about 75 individuals.

To address the concern that the families not agreeing to participate affected the representativeness of the 69% reserve-resident sample, the interviewers tabulated their personal knowledge of the number of adults and children in households and a subjective score (3-point scale) of the extent of traditional food use in the households. This was done for the 34"refusing" families and an equal number of "agreeing" families selected at random from an alphabetized list. The mean number of adults and children were 2.3 and 1.9 in the "refusing" households and 2.3 and 2.2 in "agreeing" households. There were no differences (using chi square comparison) between "agreeing" or "refusing" families in the extent of traditional food use.

From this information it was concluded that interviews from the approximately 70% agreeing RR families would adequately represent the population for the purposes of this study. The interviewers could not make a similar tally for UR families.

The interview responses were coded at UBC and the data treated with the SPSS Version 8 on an Amdahl V8 computer. The nutrient content of diets was determined with a computerized data bank (33) of 230 foods with 48 nutrients per food which was devised at the University of California, Berkeley, from USDA Handbook 8 (34) and other published and unpublished analyses. The data bank was modified for Canadian nutrient fortifications. For food items without chemical analyses (including some traditional Nuxalk foods) nutrient levels have been approximated from similar foods so there would be no missing nutrient values. Canadian recommended nutrient intakes (RNI) were used to judge nutrient adequacy (35).

RESULTS AND DISCUSSION

Native Food Resources and Harvesting Cycle

In Table 1, the species of traditional foods known by the Nuxalk people are presented in food groups and alphabetized by scientific name. The common names and Nuxalk names are given, as well as a frequency code representing the consensus of opinion by the elders committee on use between 1900 and 1930. At this time imported food items had not yet commanded a major portion of family meals.
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The food groups most heavily used (code A) were the salmonids, berries and root foods. Other primary foods were eulachons, herring roe, duck, wild crabapples, western hemlock inner bark, laver seaweed and Labrador-tea. These foods together with those noted with codes B and C, and the infrequently used species listed in the footnote to Table 1, presented a rich and obviously varied diet for the Nuxalk people. A brief description of the major uses and processing techniques of food groups is given below.

The yearly food availability and harvesting cycle for the Nuxalk traditional food species is given in Table 2. Although some species are harvested during a short season, the quantity of food harvested made major contributions to yearly food supplies. Examples of these significant species are eulachons (**Thaleichthys pacificus**), sockeye (**Oncorhynchus nerka**) and coho (**O. kisutch**). On the other hand, some foods such as trout, flounder, sea cucumber, and rabbit were present year round, but were not utilized in large quantities. The relative significance of each food in the yearly cycle can be determined by using Table 2 together with the use codes in Table 1.

Salmonids. Five species of salmon (**Oncorhynchus** spp.) have always been primary food for the Nuxalk. Their annual arrival in the Bella Coola River continues to be recognized as an important cultural and economic event. The first salmon to be netted after the new year is spring salmon, the largest of the five species with an average weight in the Bella Coola River of 10 kg. The usual run for spring salmon is March through mid-June, with the greatest density occurring in April. Sockeye and humpback salmon (both average 1.5 kg) run more or less simultaneously from late May through mid-

TABLE 1

Nuxalk Native Food Resources[1]

Scientific Names	Common Names	Nuxalk Names	Use[2] Code
Salmonids			
Oncorhynchus gorbuscha	humps, pinks	kap'ay[3]	A
O. keta	dogs, chums	t'li	A
O. kisutch	coho, silver	ways	A
O. nerka	sockeye	samlh	A
O. tshawytscha	spring, chinook, king	amlh	A
Salmo gairdnerii	steelhead	k'lat	A
Salmo spp., Salvelinus spp.	trout	tutup	C
Other fish			
Clupea pallasi	herring-roe	klkl, at	A
Ophiodon elongatus	ling cod	nalm	B
Platichtys stellatus	flounder	pays, nukakals	B
Sebastes ruberrimus	red cod, snapper	lc7iixw	B
Thaleichthys pacificus	ooligans-flesh and oil	sputc	A
Shellfish/other seafood			
Cucumaria spp.	sea cucumber	7lats	C
Haliotis spp.	abalone	plxani	B
Mytilus edulis	mussels	smiks	B
Neptunes spp.	crab	k'inacw	B
Phoca spp.	seal	ascw	A
Strongylocentrotus spp.	sea urchin	mtm	B
Several genera	clams	ts'ikwa	B
Game			
Alces alces	moose	skma	C
Anas spp.	duck	naxnx	A
Canachites spp. Dendragapus spp.	grouse	mucwmukwt, takws	C
Odocoileus spp.	deer	scwpanilh	C
Oreamnos americanus	mountain goat	yaki, qwwaax	C
Sylvilagus spp., Lepus americanus	rabbit	qax	C
Tree foods			
Populus trichocarpa	black cottonwood-inner bark	aq'miixalhp	B
Pyrus fusca	wild crabapple-fruits	p'c	A
Tsuga heterophylla	western hemlock-inner bark	sal'lalhp	A

continued . . .

TABLE 1 (con't)

Scientific Names	Common Names	Nuxalk Names	Use Code
Berries			
Amalanchier alnifolia	saskatoons	sq'sk	A
Arctostaphylos uva-ursi	kinnikinnick	milicw	A
Cornus canadensis	bunchberries	p'xwlht	A
Fragaria vesca	wild strawberries	qululuuxu	B
Gaultheria shallon	salal	mikw'lh	A
Ribes bracteosum	stink currants	q'is	A
R. divaricatum	wild gooseberries	atl'anulh	A
R. laxiflorum	wild blue currants	ts'ipscili	A
Rosa nutkana	wild rose-hips	skupik	C
Rubus idaeus	wild red raspberries	qalhqa	A
R. leucodermis	blackcaps	usukw'ltlh	A
R. parviflorus	thimbleberries	snutatiiqw	A
R. spectabilis	salmonberries	qaax	A
Sambucus racemosa	red elderberries	k'ipt	B
Shepherdia canadensis	soapberries	nuxwski	A
Vaccinium alaskense	watery blueberries, or Alaska	snuqlxlayk	A
V. membranaceum	mountain bilberries	sqaluts	A
V. ovalifolium	grey blueberries, or oval-leaved	spuuxaltswa	A
V. parvifolium	red huckleberries	sqala	A
V. vitis-idaea	lowbush blueberries	lk'skn	A
Viburnum edule	highbush cranberries	st'ls	A
Root foods			
Dryopteris felix-mas, D. expansa	fern-rhizomes	sqw'alm	A
Fritillaria camschatcensis	"rice root"-bulbs	ilk	A
Potentilla pacifica	silverweed, or cinquefoil-roots	uq'al	A
Trifolium wormskioldii	springbank clover-rhizomes	t'xwsus	A
"Greens"			
Epilobium angustifolium	fireweed-shoots	ts'ayxlhp	C
Heracleum lanatum	cow-parsnip, or wild rhubarb-shoots	xwiq'	C
Porphyra perforata	laver seaweed	lhaq's	A
Rubus parviflorus	thimbleberry-shoots	sxts	C
R. spectabilis	salmonberry-shoots	qaxaxlhpsxts'i	C
Urtica dioica	young stinging nettles	tsna	C
"Tea"			
Ledum groenlandicum	Labrador-tea	pu7yaas	A
Rubus spectabilis	salmonberry bark-tea	qaaxlhp	B[4]

continued . . .

Footnotes to TABLE 1

(1) Foods currently used or were used since 1900 by contemporary Nuxalk elders. It is recognized that in the more distant past, traditional food use may have been different, and that other species may have been utilized. Similarly, use frequency for many species has changed during this century.
(2) Use code as defined by Nuxalk elders during meetings in 1981-1982. These frequency codes stress patterns during 1900-1930.
  A. Used often in season and preserved for later use.
  B. Used often in season, not usually preserved.
  C. Occasional use, not usually preserved.
(3) Spellings as noted in Nater, H.F. (1977). A practical guide to pronouncing the orthographic symbols is found in Turner, N.J. (1973).
(4) Other foods mentioned only infrequently and being used to less extent include the following:

Animal Foods

Acipenser medirostris (sturgeon)
Branta canadensis, Anser spp. (geese)
Caprella laeviuscula primarily, (shrimp)
Castor canadensis (beaver)
Cryptochiton stellari primarily, (chiton)
Cygnus spp. (swan)
Erethizon dorsatum (porcupine)
Eumetopias jubatus (sea lion)
Felix lynx (lynx)
Gavia spp. (loon)
Hippoglossus stenolepsis (halibut)
Lagenorhynchus obliquidens (dolphin)
Larus spp. (seagull)
Octopus dofleini (octopus)
Ondatra zibethicus (muskrat)
Orcinus orca primarily, (whale)
Phalacrocorac auritus (cormorant)
Phocoenoides dalli (porpoise)
Rangifer tarandus groenlandicus (caribou)
Ursus americanus (bear)

Plant foods

Aralia nudicaulus (sarsparilla)
Chenopodium album (lambsquarters)
Lupinus nootkatensis (lupine)
Maianthemum dilatatum (lily-of-valley)
Polypodium glycyrrhiza (licorice fern)
Pteridium aquilinum (bracken fern)
Rumex acetosella (sheep sorrel)
Rumex occidentalus (western dock)
Smilacina stellata (star-flowered Solomon's seal)

July, with the heaviest period in June. Dog salmon (average 8.0 kg in summer and 4.8 kg in fall) and coho (5.5 kg) run in late summer and into the autumn. Of the five species, sockeye, coho and spring salmon are used in the greatest quantities by the Nuxalk today. Steelhead (average 5.5 kg) have a longer season of availability, but they usually do not run in the same density as the salmon. This fish is highly appreciated when caught in winter and early spring. Smaller trouts (Rainbow, Dolly Varden, etc.) are occasionally caught by line fishermen, and are mostly prepared fresh rather than preserved.

Cooking of the fish is done with a variety of methods: baking, stewing, broiling, grilling, frying or barbequeing with an open fire. The principal method of preserving the salmonid flesh in earlier days was to smoke it with an alder fire until dry. Gradually during this century, canning

TABLE 2

Nuxalk Native Food Yearly Harvesting Cycle

Food	Months											
	J	F	M	A	M	J	J	A	S	O	N	D
Salmonids												
humps						-------						
dogs							----------					
coho								---------				
sockeye						--------						
springs					-------							
steelhead	----------									----------		
trout	----------											
Other fish												
herring		------										
ling cod	----------											
flounder, red cod	----------											
ooligans			--------									
Shellfish/other seafood												
sea cucumber	----------											
abalone	----------											
mussels, crab, seal	----------											
sea urchin	----										--------	
clams	------			----------								
Game												
moose, duck, grouse										----------		
deer, mountain goat	-----									----------		
rabbit	----------											
Tree foods												
black cottonwood								-----				
wild crabapple											------	
western hemlock								------				

continued . . .

TABLE 2 (con't)

Food	Months											
	J	F	M	A	M	J	J	A	S	O	N	D
Berries												
saskatoons							----	----				
kinnikinnick								----	----			
bunchberries						----	----	----				
wild strawberries						----	----					
salal							----	----	----			
stink currants							----	----				
wild gooseberries							----	----				
wild blue currants							----					
wild rose									----	----		
wild red raspberries							----	----	----			
blackcaps							----	----				
thimbleberries							----	----	----			
salmonberries						----	----					
red elderberries							----	----	----			
soapberries							----	----				
watery blueberries							----	----				
mountain bilberries								----	----			
grey blueberries							----	----				
red huckleberries								----	----			
lowbush blueberries								----	----			
highbush cranberries								----	----			
Root foods												
fern rhizomes	----	----							----	----	----	
"rice root" bulbs	----	----	----						----	----	----	
silverweed roots	----	----	----							----	----	
springbank clover rhizomes	----	----	----							----	----	
"Greens"												
fireweed shoots , cow-parsnip			----	----	----							
laver seaweed	----	----	----	----	----	----	----	----	----	----	----	
thimbleberry shoots			----	----	----							
salmonberry shoots			----	----	----							
young stinging nettles			----	----								
"Tea"												
Labrador-tea	----	----	----							----	----	
salmonberry bark tea	----	----	----							----	----	

(cans, jars), freezing and salting have become popular ways of preserving fresh or lightly smoked fish. There is a variety of techniques used for cutting and preparing salmonid flesh for smoking and/or smoke-drying, and this depends on the species and the desired end product. Smoking can be done for 2 days - 2 weeks, and smoked fish can be canned, frozen or stored at room temperature if thoroughly smoked to dryness. The most popular hard-dry smoked salmon is a type of jerky (**sluq**), usually prepared from spring, dog, coho or steelhead. Alder wood is still the only firewood used for smoking fish by the people.

In earlier days, all parts of the fish were used as food: head, tail, internal organs, fins and bones were preserved by smoking, stored, and later used for flavorful stews. Fish roe were prepared in several different ways, depending on the species. All roe were eaten fresh after simmering with a variety of other foods, but the roe of steelhead, dog salmon, coho, and hump salmon were also preserved by ripening at room temperature (15-20°C) for 10 days-2 weeks. Ripened roe of steelhead, dog and hump salmon were preferred as a loose mixture in water (**tmkwa**) whereas that of coho was ripened in layers of intact roe skeins (**anultz**). Both **tmkwa** and **anultz** are considered as important cultural foods. The elders also recalled that roe in intact skeins, especially from spring salmon, was preserved by smoking to dryness in earlier days. Today, the use of ripened salmonid roe is greatest among the middle and older generations.

Other fish, shellfish, and seafoods. In the traditional food cycle, the most prominent of these seafoods is the ooligan (**Thaleichthys pacificus**). These fish continue to be harvested in large quantities during a short season in early spring. They are used as a flesh food, being prepared fresh (boiling, frying, baking) and preserved (smoking, salting, freezing) (20). In addition, this lipid-rich fish is used to prepare a traditional fat, called "ooligan grease", which is important as a cultural food and as a rich source of vitamins A and E (20).

Seal and herring roe are also prominent foods, both usually harvested on the outer coast. Herring roe is still a frequently used traditional food. The cods, flounder and shellfish continue to be used fresh, especially during the commercial fishing season when native fishing boats are in the channel and outer coastal areas.

Game. Of the game species, only duck was a frequently used item. Deer, moose, and mountain goat were highly appreciated, but even in the earlier days of this century, they were not successfully hunted by all families. When bagged, the meat was formerly smoked and dried; today it is stored in home freezers directly after butchering. Grouse and rabbit were only used as food occasionally.

Tree foods. The inner bark of the western hemlock tree (**Tsuga heterophylla**) was an important food in former times. It was scraped from the tree after removing the outer bark, then cooked, dried and pulverized for easy storage. It was a sweet flavor additive to many dishes, such as ripened roe, cooked salmon roe, soapberries, dried coho and cooked rice-root. It was also used as an infant food when lactation failed. The inner bark of the black cottonwood tree (**Populus trichocarpa**) was used only as a fresh food, and it was eaten uncooked. Wild crabapple fruits (**Pyrus fusca**) were lightly cooked in water and stored under a layer of ooligan grease.

Berries. Berries were always important traditional foods for the Nuxalk people, and several berries are still harvested and preserved in large quantities. The most prominent and favored wild species were raspberries, blackcaps, thimbleberries, salmonberries, red huckleberries, grey blueberries, highbush cranberries, stink currants, and soapberries. Also harvested in large quantities and preserved, but to a lesser extent than those just mentioned, were saskatoons, kinnikinnicks, bunchberries, salal berries, wild goose berries, wild blue currants, watery blueberries, lowbush blueberries, and mountain bilberries. Red elderberries were not often preserved by most women, but they were always cooked before eating. Wild strawberries were highly appreciated, but not found in large enough quantities to warrant preservation. Wild rosehips were eaten from the bush as an occasional food, and not picked in quantity. In earlier days berries were sun-dried on racks lined with thimbleberry leaves or they may have been smoked (**shu-shu**). They were then stored in wooden boxes, often under a protective layer of ooligan grease. With the advent of modern techniques for jarring foods, using sugar, and home freezing, these species are now preserved in the usual ways. Several species may be mixed for preservation. In the summer months, wild berries continue to be served fresh at mealtime, and most are ever-present in the reserve area, and nearby, for occasional snacking.

Root Foods. These were important fresh foods in autumn and winter. Silverweed roots and springbank clover rhizomes, especially, were dug in large quantities in the fall, bundled, and stored in root cellars for later-use (22). Harvesting could take place through the winter and early spring before new plant growth made the roots less desirable. Today none of the root foods are extensively used.

Greens. Green plant foods were a welcome addition to the traditional diet in early spring. Except for the seaweed which was dried on the outer coast and used year-round by the Nuxalk, green plant foods were used only fresh in season. Usually greens were not prepared as a mealtime food, but were eaten as occasional snack food when outdoors. Young stinging nettles were the exception in that they were lightly steamed and served at the table. The shoots and the stalks of cow-parsnip were eaten raw after stripping off the outer coverings of the plant stems.

Teas. Labrador-tea was the favored traditional beverage, besides water. The leaves continue to be harvested after the frost in the autumn, and are then stored for year-round use. Salmonberry bark tea was also a favorite beverage, and occasionally a medicinal drink, prepared by boiling the woody bark stripped from the tall salmonberry bush stems.

Contemporary Use of Traditional Foods

Questionnaire data on traditional foods harvested by contemporary RR and UR families were tabulated and grouped into four categories (Table 3). Proportionally more RR families use traditional foods than do UR families. Although fish foods are used to some extent by virtually all families, RR families used more than 5 times the fish that urban families did. Although nearly all UR Nuxalk families wished to have more fish, about half of the RR

TABLE 3

Traditional Food Use by Reserve-Resident (n=73) and Urban (n=17) Nuxalk Families

Food Category	% of Families Now Using		Average Quantity* in 1980-81 Cycle (kg)		% of Families Wishing to Use More Food	
	RR	UR	RR	UR	RR	UR
Fish	98**	100	187	33	52	94
Berries	65	57	18.4	6.4	13	15
Game	46	21	10.5	4.5	16	15
Other plant foods	35	29	<0.5	<0.5	33	31

*Quantity used by those families using any at all

**One elderly RR couple reported not using fish for medical reasons.

families felt they had as much as they wanted. Frequency of wild berries was less in both RR and UR families, although RR families used more. Game (especially deer and moose) was used more by RR families, but there was quite a bit of sharing of the meat among RR and UR families. Other plant foods, primarily Labrador-tea and greens, were used to a limited extent by about a third of RR and UR families. The food categories most desired for increased use were fish and other plant foods, whereas only about a sixth of RR and UR families wished to use more berries and game.

Contemporary Food Use Defined by Dietary Recalls

Use of all foods grouped into common categories is shown in Table 4. A similar percentage of the adult men and the women consumed the foods so grouped for both the RR and UR people.

In both groups of adults noted in Table 4, more people were consuming meats than fish during this period when fish are plentifully abundant in Bella Coola. However, a greater proportion of RR adults consumed fish than UR's, thus corroborating the extent of fish use reported in Table 3. Dairy products were used more by UR adults and RR women. Fruits, juice (including traditional berries), and potatoes were used more by RR than UR adults, whereas, in general, vegetables were used more in the urban areas. Breads,

grains, cereals, etc. were used more or less in similar proportions among all groups of adults.

TABLE 4

Foods Eaten in July/August by Contemporary Nuxalk Adults (aged 19-76)

Food Group (usual weight per serving) g.	% of Recalls Containing at Least 1-Serving within Food Group	
	RR[1] men & women 19-76 yr. n=82	UR[2] men & women 19-46 yr. n=15
Fish (85)	27	19
Shellfish (85)	--	6
Meats (85)	67	63
Eggs (55)	38	25
Nuts (15)	7	--
Legumes (100)	--	6
Dairy products (244)	55	63
Main dishes, mixed foods (200)	35	13
Fruits and juice (120)	51	31
Vegetables (65)	39	56
Potatoes (50)	54	31
Breads (23)	84	75
Grains (75)	23	19
Ready-to-serve cereal (28)	17	19
Sugars and sweets (20)	47	38
Fats and oils, free (5)	61	63
Coffee and tea (200)	79	75
Sweet, carbonated beverages (339)	12	19
Baked desserts and puddings (80)	15	13

[1]Reserve-resident; [2]Urban-resident

Nutrient Adequacy of the Contemporary Diet

The results of analysis of the one-day nutrient intakes of reserve-resident women, aged 19-49 years, is given in Table 5. The intake data is presented as the mean and standard deviation per 1000 kcal, and the percent of the group with intakes below three different levels of the Canadian RNI (2/3 RNI, 1/2 RNI, or 1/3 RNI). Nutrient levels are given per 1000 kcal, because this notation is in keeping with the RNI for several vitamins (35).

Protein intake for this group of women was reasonably high (mean of 52 g/1000 kcal, and only 10% falling below 2/3 RNI and 3% below 1/2 RNI. Fat and cholesterol intakes were also generally high (mean of 45 g and 429 mg,

respectively, per 1000 kcal). However, crude fiber was low, with a mean intake of only 1 g/100 kcal, which reflects a generally low consumption of whole grains, fruits and vegetables. Total energy intake of the Nuxalk women ranged from 350-2300 kcals.

TABLE 5

One-Day Nutrient Intakes and % with Intakes Below the Canadian RNI for Reserve-Resident Women (19-49 yr.)

Nutrient	Intake/1000 kcal ($\bar{X}$ ± S.D.)	% with Intakes < RNI (n=40)		
		≤ 2/3 RNI	≤ 1/2 RNI	≤ 1/3 RNI
Protein (g)	52 ± 12	10	3	0
Fat (g)	45 ± 11	NA		
Total carb. (g)	94 ± 25	NA		
Crude fiber (g)	1 ± 1	NA		
Sucrose (g)	22 ± 17	NA		
Cholesterol (mg)	429 ± 445	NA		
Vit A (IU)	1810 ± 1247	54	36	23
Vit D (ug)	5.4 ± 6.5	33	28	23
Vit E (mg)	2 ± 1	80	67	51
Thiamin (mg)	0.7 ± 0.4	39	21	13
Riboflavin (mg)	1.2 ± 0.9	10	8	5
Niacin (mg)	14.3 ± 9.4	31	18	5
Pyridoxine (ug)	808 ± 335	15	8	3
Cyanocobalamine (ug)	4 ± 3	15	13	5
Ascorbate (mg)	38 ± 34	44	36	21
Folate (ug)	67 ± 34	77	69	46
Pantothenate (ug)	3246 ± 1516	NA		
Biotin (ug)	35 ± 22	NA		
Na (mg)	1241 ± 687	NA		
K (mg)	1506 ± 392	NA		
Ca (mg)	360 ± 233	67	56	33
P (mg)	756 ± 209	21	10	3
Mg (mg)	124 ± 40	49	26	13
Fe (mg)	7 ± 2	64	39	21
Zn (mg)	6 ± 2	33	18	8
I (g)	35 ± 22	67	41	26
Cu (mg)	1 ± 1	NA		

Vitamin E, folate and calcium appear to be the nutrients in shortest supply in that more than 1/3 of the group consumed less than one-third of the Canadian recommended nutrient intake, the level of poorest intake noted

in Table 5 (51%, 46% and 33%, respectively). Twenty to thirty-three percent of the group had less than 1/3 RNI for vitamin A, vitamin D, ascorbate and iron. Copper intake was also low, with a mean intake of 1 mg/1000 kcal. Phosphorus intake was about twice that of calcium, and the ratio of potassium to sodium was 1.2. Sodium intake was moderately high with a mean of 1241 mg/1000 kcal, not considering salt added at the table.

Diets of reservation-resident Hopi and Navajo Indian women in Arizona were similarly evaluated (4,5). It was found that intakes of calcium, iron, vitamin A, folacin and ascorbate (among other nutrients) were limited. Although the protein content of the diets of Hopi, Navajo and Nuxalk women were generally adequate, the highest level of protein intake was that reported here for the Nuxalk. This reflects the high Nuxalk consumption of fish and meats, as noted in Table 4.

Although there were too few dietary records (n=21) from urban-resident Nuxalk people to warrant a separate treatment of nutrient intake and statistical comparisons, it is worth mentioning that more than 60% of the one-day records were below 2/3 RNI for vitamin A, vitamin E, folate, pyridoxine, iron, and magnesium. Calcium intake was below 2/3 RNI for 57% of the UR people. Thus, it appears that the higher intake of vegetables of the UR in comparison to RR nuxalk people noted in Table 4 was not sufficient to ensure adequacy for these nutrients.

Although one-day recalls are not expected to represent usual individual nutrient intakes (36-38), they can give the trends in group intake (39), especially when the data are taken within one season (40). Four- to seven-day intake records per individual would have been better to estimate intakes for individuals and the group (37, 41, 42) but the extent of interviewing required was not possible in the context of the recent interview study. These limitations of the one-day intake records probably apply to the food group data, as well. However, further credibility is given to the data when all the RR diet recalls (n=133, including the 40 women's diets) were evaluated and compared to the respective RNI's for each age/sex category. The % of the RR group below 2/3 RNI was greatest for the same nutrients mentioned for the RR women alone: vitamin E, 84%; folate, 79%; calcium, 70%; vitamin A, 58%; vitamin D, 44%, etc. (not shown in Table 5). Therefore, it is concluded that these data can be used to identify the nutrients most at risk in the population, even though they are not complete enough to establish actual intakes.

Information on use of nutrient supplements and medicinal drugs was requested in the interviews, but aditional nutrient intake from these was not computed and reported here. Nutrient supplements are routinely given to children under twelve (chewable, multivitamin/mineral variety), but adults rarely consume nutrient supplements, and are therefore more likely to be at risk than the younger people for many of the nutrients mentioned.

The nutrient needs most pressing for the adult women could be met by the use of more vegetables and fruits, by substituting vitamin-rich fats such as ooligan grease for marketed fats such as lard and solid vegetable fat. More low-fat dairy products or native calcium-rich foods such as processed fish containing skin and bone would also be helpful. Although protein intake is apparently not of concern, iron and copper intakes could be improved with more shellfish, fish and meat, or with mineral-rich native root foods (22). These dietary improvements would undoubtedly benefit other age/sex segments of the population, as well.

CONCLUSIONS

The traditional diet known to the people of the Nuxalk Nation in former times contained a wide variety of foods, many of which were available throughout the year because of native food processing technology. Although the complete nutrient profile of all of the traditional native foods is not yet available, it is reasonable to expect that a diet with plentiful amounts of seafoods, fruit and marine fats, augmented with roots, game, tree inner bark and greens would provide adequate nutrients for the population. The contemporary Nuxalk people have adopted many marketed foods into their diet, with urban-resident families now using more marketed foods and fewer traditional foods than reserve-resident families. Although the array of marketed foods available to urban-resident families is greater, many would prefer to have access to more of their traditional foods, especially fish. The most noticeable differences in urban-resident diets, in comparison to reserve-resident diets, were more vegetables and dairy products, and less fish, fruits and potatoes for the urban-residents.

Dietary nutrient adequacy of both reserve-residents and urban residents was poor. Reserve-resident women of child-bearing age had one-day intakes below 2/3 RNI for vitamin E, folate, calcium, vitamin D, ascorbate, and iron in the majority of diets. Diet records of urban-residents reflected poor intake of vitamin E, folate, pyridoxine, iron, magnesium and calcium.

Since native people are generally among those with the lowest incomes of Canada, it is reasonable to assume that dietary improvement for reserve-resident populations could most effectively be made with use of locally-available traditional foods with high nutrient density. If more traditional native foods could be made available to urban-resident native families, they would also make a positive contribution to nutrient intake.

ACKNOWLEDGMENTS

The many Nuxalk people who participated in the elders' meetings and the family food use interviews are gratefully acknowledged. In particular, I would like to thank Theresa Barton, David Hunt and Emily Schooner for interviewing assistance. Sandy Moody and Rose Hans were exceptionally supportive on the reserve. For help in data treatment, appreciation is extended to Rhea Joseph, Anthea Kennelly and Sandra Marquis, as well as to Frank Flynn of the Faculty of Arts Centre for Computing and Data Analysis. Nancy J. Turner graciously provided assistance with botanical terms and editing. This study would not have been possible without the multilevel encouragement of Margo Palmer of the Health Promotion Directorate. Financial support is acknowledged from Health and Welfare Summer Canada (1216-9-169), the Canadian Ethnology Service (1630-1-474), the Social Sciences and Humanities Research Council (451-822415) and the Health Promotion Contribution Program (655-2-28) of Health and Welfare Canada.

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Accepted for publication July 16, 1984