NUTRIENTS IN NATIVE FOODS OF SOUTHEASTERN ALASKA

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ABSTRACT.—Cultural, health and ecological concerns have stimulated interest in learning the nutrient content of the foods of southeastern Alaska coastal Native Americans. Twenty foods indigenous to southeastern Alaska were analyzed for proximate composition, two minerals and five vitamins. Many traditional foods are still eaten by southeastern Natives and the nutrient values determined in this study showed that these foods can make important dietary contributions. Seafoods such as seaweeds and marine animals are excellent sources of certain minerals and vitamins: eulachon, leather chiton, and cockles are high in iron; leather chiton, the seaweeds and hard dried sockeye salmon are good sources of calcium; eulachon has a high level of vitamin A. Other wild plant foods also make valuable nutritional contributions.

INTRODUCTION

Throughout history Native populations have subsisted on those foods indigenous to their local environments. Intimate knowledge of many foods edible within a territory was imperative for survival. Native peoples of the northwest coast of North America had particularly rich food supplies. The cool-temperate rain forest environment, with an annual precipitation in excess of 200 cm, produced an abundance of many kinds of berries, roots and greens. The beaches and waters teemed with fish and other marine and freshwater life. Game animals and birds were also available (Underhill 1945, Drucker 1955).

When trade with the Europeans began in the late 1700's flour and sugar were introduced. For a considerable period of time use of "white man's foods" was limited and any effect on health was not recorded. However, in 1933 a dentist working among Alaskan Eskimos and Indians noted changes in their dental health (Price 1939). Since World War II, use of "outside foods" rapidly increased. Heller (1964) reported that in the north of Alaska the Eskimo population had increased its intake of carbohydrate calories from an estimated 2 to 11% in aboriginal days to approximately one-third of the total calories and had also increased intake of saturated fats. Schaeffer (1971) also made a comprehensive report on the effects of similar major dietary changes among Canadian Eskimos. Because these changes have apparently resulted in increasing health problems for Alaska's Natives, consideration is being given to what can be done to improve the situation. Increased knowledge of traditional foods is a starting point for nutrition education programs suited to native people.

PRESENT DAY CONCERNS

Southeastern Alaska is a rugged island archipelago extending from Annette Island in the south to Yakutat in the north. Of a total population of approximately 50,000, nearly 10,000 are Native, belonging to three groups: the Tlingit, Haida and Tsimpshean (tribal spelling), of which the Tlingit is the largest. Their foods are quite similar but variations in preferences occur. Typical of most cultures, these people have high regard for their traditional foods but have had feelings of inferiority about them for many years because the Caucasian community has regarded many of them as strange.

Despite the large number of wild foods available, little is known about their nutrient content. Researchers have cited the lack of nutritional information on the foods of other Native groups (Benson et al. 1973, Kuhnlein et al. 1979). Regard should be given to the resurgence of cultural pride which has intensified Native interest in obtaining such information. In addition, health workers could frequently use such facts when treating Native clients.

Because of a desire to stimulate recovery of old knowledge of their culture, as well as to consider ways to decrease the incidence of obesity, coronary disease, hypertension and diabetes, the Southeast Alaska Regional Health Corporation, a Native organization, sought and obtained funds from the State of Alaska in 1980 to perform these nutrient analyses of twenty southeastern Alaska Native foods.

Limited nutrition information for some of these foods can be found in USDA food composition tables (Watt and Merrill 1983). However, the data are often incomplete. The National Marine Fisheries Service has reported nutrient values of many marine animals in the raw state (Sidwell et al. 1974, 1977, 1978a, 1978b). Heller and Scott (1967) have reported information on foods utilized by Natives in the northerly regions of Alaska. Turner studied the plant foods of British Columbia Native, but a detailed nutrient analysis for most southeastern Alaska Native foods has not be available.

METHODS

Eight southeastern Alaska Natives, from six different towns, and recognized by the Native community to be knowledgeable about wild foods, were contacted for information and suggestions about foods to be collected for the analysis. Most foods, so identified, had a long history of use, although styles of preparation have changed over the years. A list of 20 foods was made from the recommendations of these people.

Nomenclature for wild foods can be a problem because common names often vary from one village to the next. The ten Native villages of this panhandle portion of Alaska are in isolated locations on the numerous islands that characterize the study area. These villages are seldom connected by roads so float planes or boats are the primary means of transportation. Certain types or styles of food preparation may be more popular in one community or area than another. At the same time, there are also individual differences within each community. Most common names used in this study are those that have widest usage. In one instance, to avoid misunderstanding, the term "leather chiton" is used instead of "gum boots", which is the name used by Natives. Scientific identification of vascular plants was made by Mary Muller, U.S. Forest Service botanist for the Tongass National Forest.

Twelve of the foods analyzed were obtained in the Haida village of Hydaburg. The remainder were provided by individuals in Sitka and Ketchikan. Remoteness, travel complications, communication problems, all peculiar to Alaska, caused collecting difficulties.

Each sample, except the eulachon fat, was prepared at the home of the donor for family use. At the time of collection, all donors were queried about how the food had been prepared. All donors were individuals with a good knowledge of sound food preservation techniques. All indicated that their foods had been prepared promptly after being harvested (Table 1).

COLLECTION AND PREPARATION OF FOODS

Each foods was collected by the author at the home of the donor. The donor had previously frozen or otherwise preserved the food but the author did not participate in or observe any of the food preservation.

TABLE 1.—Dates of harvesting, amount, shipment, analysis, preparation, and point of collection of 20 southeastern Alaska Native foods.

Date	Amount	Food	Activity	Preparation	Point of collection
Spring 1979	85 g	ribbon seaweed	harvested	dried	Sitka
Spring 1980	454 g	herring eggs (2 samples)	harvested	frozen	Hydaburg
	170 g	black seaweed		dried	Hydaburg
	454 g	sea cucumber		frozen	Hydaburg
	454 g	eulachon		dried, frozen	Ketchikan
	454 g	eulachon fat		fermented, frozen	Hydaburg
	454 g	octopus		frozen	Ketchikan
	454 g	cockles		frozen	Hydaburg
	454 g	salmonberry		frozen	Sitka
Summer 1980	454 g	blueberry	harvested	frozen	Sitka
	454 g	huckleberry		frozen	Sitka and Hydaburg
		beach asparagus		frozen	Hydaburg
	454 g ea.	salmon (4 samples)		3 canned, 1 dried	Hydaburg/ Ketchikan
	454 g	venison		frozen	Hydaburg
December 1980			17 foods shipped to laboratory		
January 1981			17 foods analyzed		
Spring 1981	454 g	leather chiton	harvested	frozen	Sitka
	454 g	fern fiddlehead		frozen	Sitka
Spring 1981		leather chiton fern fiddlehead	shipped and analyzed		
	85 g	ribbon seaweed		dried	
	454 g	salmonberry		frozen	Sitka
	454 g	blueberry		frozen	Sitka
	454 g	huckleberry		frozen	Sitka

Herring eggs on kelp, herring eggs on hemlock branches, leather chiton and berries were kept frozen in plastic bags with no other treatment before the nutritional analysis. Since herring eggs which have been deposited on kelp are eaten with the kelp, the kelp was included in this sample. This is not the case when the eggs have been deposited on hemlock branches. In this instance the eggs alone were analyzed after being removed from the branches at the lab. Sea cucumber, venison and octopus were eviscerated and frozen. Fern fiddleheads and beach asparagus were blanched, then frozen. Cockles were steamed, removed from the shell, then frozen. Seaweed was dried after collection and stored in plastic bags in a cool, dry place. All other foods were in one pound (454 g) amounts.

The samples of salmon were each prepared with a different variation. Most Native women do not use measuring cups and spoons or check temperatures during drying and smoking. Ingredient amounts are estimated. One donor estimated her smoking temperatures varied from 48° to 74° C. The smoked, canned king salmon was prepared using a brief immersion in a salt water solution that "contained enough salt to float a potato" (355 ml/3.8 l water, determined later by the author), then smoked 1.5 days and canned.

The "kippered" king salmon had been marinated for about ten minutes in a salt solution which contained brown sugar and soy sauce. Sometimes soy sauce is substituted for all or part of the salt solution. Brown sugar may be used with approximately equal amounts of salt, i.e. 118 ml salt, 118 ml brown sugar/.95 l water. After the marination period the fish was hung for approximately six hours or overnight, until it had a glazed appearance indicating the desired degree of dryness. The donor of the kippered king salmon said the fish was smoked for two days, then put into cans and processed at 10 pounds pressure for 60 min.

Another donor used a considerably different procedure for her kippered sockeye. It had been soaked for about three hours in a sugar-salt brine. She used a longer soaking period because she used "less salt than many women." She chose not to state amounts used. After the marinating period the salmon was smoked at a "very controlled heat to avoid overcooking the fish". Following the smoking process it was canned.

The "hard-dried" sockeye was the only salmon sample not home canned. It was briefly marinated in a brine solution, ("enough salt to float a potato") followed by a very slow alder and spruce smoke for a week. A long period of smoke was used because smoking was to be the primary means of preservation with no further canning or freezing anticipated. This salmon sample was frozen after it was received from the donor and kept frozen until the lab analysis, simply because that was the most convenient way to hold it. "Hard-drying" is the "old way" of preserving salmon. Fish prepared by this method would normally be stored in a cool, dry location.

The dried eulachon had been eviscerated and left whole, marinated in the brine solution ("enough salt to float a potato"), then smoked and hard dried for four to five days. Since eulachon are much smaller than salmon, "hard smoking" can be achieved in less time than is required for salmon.

The donor of the eulachon oil had purchased the home canned oil from a friend, then stored it in her home freezer. She thought the eulachon had been fermented first, then cooked, in order to render the fat because "that was the way it was usually done." This was the only information available regarding the sample. Instead of the routine nutrient analysis done on all the other foods, a fatty acid analysis and vitamin A test were performed on the eulachon oil.

The venison sample provided to the author had been ground then frozen for a home freezer. It is unknown which parts were included in the sample. Because of extremely high shipping costs and limited storage facilities all the foods were collected and stored in a home freezer at -18° C in Sitka, then sent to the Columbia Laboratories in Corbett, Oregon via air express on two separate dates (Table 1).

LABORATORY ANALYSIS

Analyses were performed by Columbia Laboratories on foods as they were received, without treatment such as washing. Since these foods were considered ready to eat by the persons preparing them, this seemed acceptable.

In most cases the samples were ground with the use of a food processor until they were visually homogenous. Except for berries, multiple tests and statistical tests were not done.

Limits of detection were approximately:

Protein	0.2%	Iron	0.1 mg/100 g
Fat	0.05%	Vitamin A	20 IU/100 g
Carbohydrate	0.5%	Thiamin	0.01 mg/100 g
Moisture	0.5%	Riboflavin	0.01 mg/100 g
Ash	0.05%	Niacin	0.1 mg/100 g
Calcium	1.0 mg/100 g	Ascorbic Acid	0.5 mg/100 g

Tests performed by Columbia Laboratories followed procedures outlined by the 12th and 13th editions of the Official Methods of Analysis of the Association of Official Analytical Chemists (AOAC)(Horowitz, W. 1975, 1980). Taken from the 12th edition: moisture (24.003), vitamin A (43.014-.017) (FAO/WHO distribution factors for Vitamin A activity are included in AOAC methods), vitamin C (43.056-3.062), thiamin (43.024-43.038) and riboflavin (43.039). Taken from the 13th edition: protein (2.055-2.057), fat (14.019), ash (14.006), and calcium (7.091-7.094 (a), 7.095). The calcium determination involved dry ashing the sample, dissolving the ash in dilute hydrochloric acid, lanthanum added to minimize interferences, final determination by atomic absorption spectrophotometry. In the iron analysis (7.091-7.094 (a), 7.095), the sample was dry ashed, the ash dissolved in dilute hydrochloric acid, and the determination made by atomic absorption spectrophotometry. Carbohydrate values were calculated by difference. AOAC Kjeldahl procedure was used to estimate protein. Nitrogen was multiplied by 6.25 to estimate protein. Factors used to estimate calories were: protein 4, carbohydrate 4, fat 9 kcal/g.

The laboratory reported Vitamin A as International Units of retinol or carotene, depending on individual food content. Conversions to Retinol Equivalents by use of these conversion factors (Pike and Brown 1975):

$$1 \text{ mg RE} = 10 \text{ IU of beta carotene}$$

$$1 \text{ mg RE} = 3.33 \text{ IU of retinol}$$

Where foods contained both retinol and beta carotene:

$$\frac{\textit{IU beta-carotene}}{10} + \frac{\textit{IU retinol}}{3.33} = \text{RE}$$

RESULTS AND DISCUSSION

The analysis of twenty southeastern Alaska Native foods has provided data that show these foods are valuable sources of important nutrients. Table 2 shows the proximate composition and content of two minerals and five vitamins for 100 g of edible foods. Figure 1 shows kilocalorite content of these foods. Figure 2 presents the fatty acid content of eulachon fat.

TABLE 2.—Nutrient composition of 20 southeastern Alaska Native foods.

Prepared Food (100 gm), E.P.	Kilocalories	Protein g	Fat g	Carbohydrates g	Moisture g	Ash g	Calcium mg	Iron mg	Vitamin A RE	Thiamin mg	Riboflavin mg	Niacin mg	Ascorbic Acid mg
(a) Plant foods													
Beach asparagus, glasswort, *Salicornia Pacifica*, frozen, thawed	27	1.8	0.3	4.3	91.1	2.5	45	0.9	192	0.01	0.09	0.7	1.8
Fern fiddlehead, *Athyrium filix-femina*, frozen, thawed	34	3.2	0.2	4.9	91.1	0.6	23	0.8	134	0.00	0.25	2.0	8.9
Black seaweed, *Porphyra* cf. *laciniata*, dried	298	28.7	2.0	41.3	9.2	18.8	157	10.4	472	0.11	2.25	11.5	17.4
Ribbon seaweed, *Palmaria* sp., dried	323	19.9	0.6	59.5	7.2	12.8	190	11.0	2	0.07	1.00	6.9	4.8
Blueberry mixture, *Vaccinium alaskanese*, *V. ovalifolium*, frozen, thawed	44	0.7	0.0	10.4	88.7	0.2	15	1.1	16	0.03	0.10	0.4	2.2
Huckleberry, *Vaccinium parvifolium*, frozen, thawed	37	0.4	0.1	8.7	90.7	0.1	15	0.3	8	0.01	0.03	0.3	2.8
Salmonberry, *Rubus spectabilis*, frozen, thawed	44	1.0	0.1	10.0	88.6	0.4	14	0.6	155	0.04	0.07	0.1	2.4
(b) Animal foods													
Herring eggs, *Clupea pallasii*, plain, raw, frozen, thawed, removed from hemlock branches *(Tsuga heterophylla)*	56	9.6	1.0	4.4	83.8	2.2	19	2.7	6	0.10	0.12	1.8	0.6
Herring eggs on kelp, giant kelp, *Macrocystis integrifolia*, raw, frozen, thawed	59	11.3	0.8	2.6	81.8	3.9	161	3.4	9	0.10	0.13	2.7	0.0
King salmon, *Oncorhynchus tshawytscha*, smoked, canned	150	23.2	5.9	1.0	66.7	3.2	60	1.8	84	0.01	0.10	8.5	0.0

King salmon, kippered, canned	266	30.7	15.9	0.0	51.2	2.5	38	1.7	15	0.05	0.14	10.9	0.0
Sockeye salmon, *Oncorhynchus nerka*, kippered, canned	190	29.5	7.7	0.7	59.1	3.0	68	1.3	0	0.02	0.22	13.9	0.0
Sockeye slamon, hard dried	371	57.2	14.4	3.2	20.3	4.9	136	1.9	82	0.14	0.60	20.2	0.0
Octopus, *Octopus dofleini*, raw, frozen, thawed	57	11.9	0.6	0.9	84.4	2.2	24	5.3	0	0.03	0.04	2.1	0.0
Cockles, *Clinocardium nuttallii*, steamed, frozen, thawed	79	13.5	0.7	4.7	78.8	2.3	30	16.2	0	0.01	0.20	3.2	0.0
Sea cucumber, yane, *Stichopus californicus*, frozen, thawed	68	13.0	0.4	3.1	80.7	2.8	30	0.6	77	0.05	0.94	3.2	0.0
Leather chiton, gumboots, *Katharina tunicata*, raw, frozen, thawed	83	17.1	1.6	0.0	78.6	3.7	121	16.0	495	0.05	0.34	4.2	0.0
Eulachon, smoked, *Thaleichthys pacificus*	308	20.5	24.8	0.8	50.1	3.8	30	12.2	1183	0.02	0.88	5.5	0.0
Eulachon, fat, fermented, frozen, thawed									1697				
Venison, Sitka deer, *Odocoileus hemionus sitkensis*, raw, frozen, thawed	117	21.5	3.4	0.2	73.7	1.2	7	2.9	0	0.2	0.36	6.6	0.0

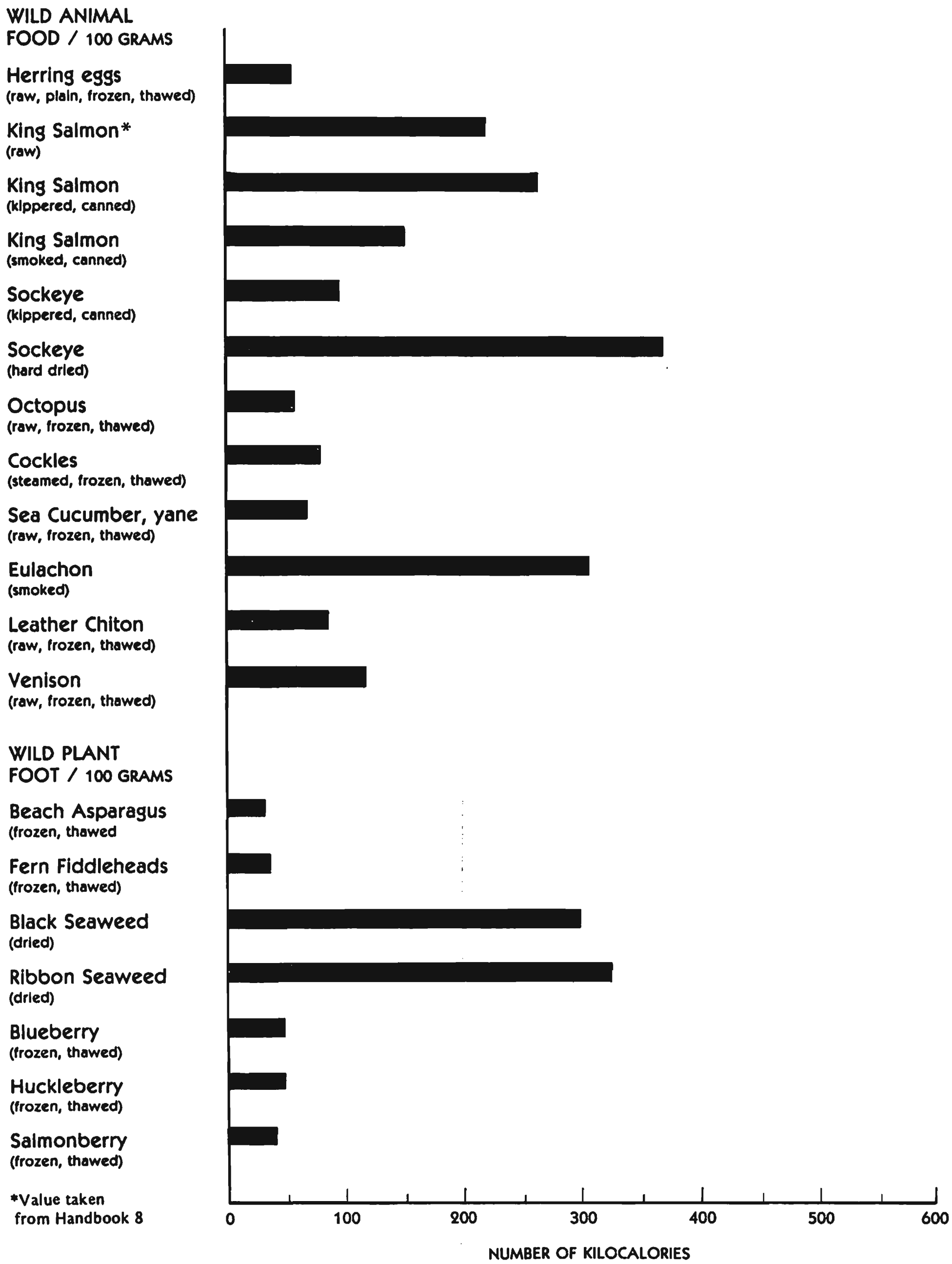

FIG. 1.—Caloric values for native animal and plant foods.

PLANT FOODS

Of the seven plant foods tested, the two dried seaweeds, black seaweed *(Porphyra* cf *laciniata*) and ribbon seaweed, (*Palmaria* sp.), were outstanding for their generally high nutrient content. A 100 g sample of each contained nearly one-half the adult Recommended Dietary Allowance (RDA) (Food and Nutrition Board 1980) for protein, almost one-quarter the requirement for calcium, all the male requirement for iron and over half the iron needed by a female. One hundred grams of black seaweed contained 100% of the RDA for riboflavin, over half the allowance for niacin and vitamin A, one-third the allowance for ascorbic acid. Japanese workers have made nutrient analyses on marine algae, but there is little American literature on their nutrient content. They are generally recognized as being excellent sources of many nutrients and some even contain vitamin B_{12} (Madlener 1977, Arasaki and Arasaki 1983). Thiamin content was low in both seaweeds (as well as in other foods).

One hundred grams of dried seaweed equals about 590 ml (2½ cups). Some Native informants reported that eating dried seaweed is "like eating popcorn" and that this amount could easily be eaten in a short period. Other Natives stated that they could not eat much because it "swelled up" and satisfied them quickly.

Beach asparagus *(Salicornia pacifica)* and fern fiddlehead *(Athyrium filix-femina)* had vitamin A values such that a 100 g portion would be adequate to meet one-fourth the adult RDA. Beach asparagus, also called glasswort, is steamed or eaten raw, but can be canned or frozen to be used later as the main ingredient of a salad. Fern fiddleheads may be added raw to salad or steamed and eaten as a vegetable.

Ascorbic acid values were tested for the three berries: blueberry *(Vaccinium alaskanese* and *V. ovalifolium)*, huckleberry *(Vaccinium parvifolium)* and salmonberry *(Robus spectabilis)*. Values were lower than anticipated, and were therefore analyzed for a second time using samples from the same (1980) time period. The two results were similar and were averaged. Subsequent analyses done in a different laboratory since this study, provided comparable values. Table 3 shows the results of each of these analyses. Handbook 8 values for fresh raw blueberries is 14 mg/100 g and 7 mg/100 g if frozen (Watt and Merrill 1963).

Low ascorbic acid values could have resulted from the seven-month storage period in the freezer before analysis. It should be noted that many people eat the berries after such a storage period, so that these values could represent actual intake. Another possible influence may have been the many cloudy, rainy days in southeastern Alaska. Studies have shown that ascorbic acid development in citrus fruit is sensitive to the amount of sunlight reaching the fruit during maturation (Nagy 1980). Conversely, Rodahl (1955) found that berries grown in drier Arctic areas had an increased ascorbic acid content probably due to the 24-hour days.

TABLE 3.—Vitamin C content of berries from two separate analyses.

Berry	1st Analysis	2nd Analysis
Blueberry	3.5 mg/100 gm	0.8 mg/100 gm
Huckleberry	2.1 mg/100 gm	3.4 mg/100 gm
Salmonberry	3.1 m/100 gm	1.6 mg/100 gm

ANIMAL FOODS

The four salmon samples varied considerably in caloric content, with the "hard-dried" sockeye being the most concentrated source of calories. King salmon is the salmon species with highest fat content according to figures from Handbook 8 (Watt and Merrill 1963). However, sockeye also contains a generous amount of fat which becomes more concentrated with dehydration, so that all values for his hard-dried sockeye sample are higher than for other salmon samples.

The salmon in these analyses contained significant amounts of calcium and iron. However, Handbook 8 values are considerably higher, possibly because of a significantly higher bone content. Calcium in canned salmon will vary with the amount of bone left in any one piece.

All salmon samples were good sources of niacin. A 100 g portion of the sample with the least, (smoked, canned king) met 50% of the adult RDA. Amounts ranged from 8.5 mg/100 g to 13.9/100 mg in the three samples which contained the lesser amounts. It should also be noted that since these samples were subjected to a significant period of high temperature during canning some loss of the B-complex vitamins may have occurred. Handbook 8 shows higher values for thiamin in both raw king and sockeye over canned and higher riboflavin values in raw king salmon. The sample with the highest value for niacin (hard-dried sockeye) contained more than 100% of the RDA with a content of 20.2 mg/100 g. Both samples of sockeye had higher values for riboflavin and niacin than king salmon. Thiamin values were low in all foods analyzed but hard-dried sockeye had better amounts than any others, again because of contentration. It is not understood why there was considerable variation in the vitamin A content of the salmon samples.

Plain herring eggs *(Clupea pallasii)* which had been removed from hemlock branches *(Tsuga heterophylla)* showed no outstanding nutrient content. Those eggs on kelp *(Macrocystis integrifolia)* had somewhat higher scores. Herring eggs are eaten plain or on the kelp on which they have been deposited and are always a special treat. When available they may be consumed in large quantities. They may be eaten raw or cooked by simmering in water briefly then dipped in seal or eulachon fat. Often they are frozen raw to be used later for special occasions.

Each spring, when water temperatures rise sufficiently to stimulate the herring to spawn, Native people will go to their favorite spots in bays and coves to collect the eggs. In locations where there is no kelp, hemlock branches may be placed on the beach at low tide and secured in place by string or with rocks. The herring deposit their eggs on the branches which, after several tidal changes, may have a sizeable concentration of eggs of up to 7 or 8 cm in thickness. Eggs are 1 mm to 2 mm in size and the production for one female may average about 20,000 eggs in a season.

Smoked eulachon *(Thaleichthys pacificus)*, leather chiton *(Katharina tunicata)* and cockles *(Clinocardium nuttallii)* all were excellent sources of iron. A 100 mg amount provides a minimum of two-thirds of the adult RDA for iron. Octopus *(Octopus dofleini)* also provided a significant amount. In northern Alaska nutritionists have been concerned about a high incidence of iron deficiency anemia among the Native population (Margolis et al. 1981). In southeastern Alaska this has not been reported to be a problem. This may be due, at least partially, to the ready availability of these foods. Cockles, which are similar to clams, are frequently found and used, along with clams, in great numbers on southeastern Alaska beaches.

Leather chiton was a good source of vitamin A. One hundred grams contained nearly one-fourth of the RDA for both riboflavin and niacin and more than one-eighth of the RDA of calcium. This nutritious member of the mollusk family, popularly called gumboots, is very well liked by southeastern Alaska Natives. Chiton can be gathered from the rocks of the rugged coastline during low tides. They are cooked briefly, below the boiling point of water, and are eaten either warm or cold, with or without seal oil or eulachon fat.

Sea cucumber *(Stichopus californicus)* was surpassed only by the two seaweeds for riboflavin content with 100 g providing over half the adult RDA. The favorite way to eat this is fried in butter or margarine after being dipped in egg and cracker crumbs.

Smoked eulachon, with its Vitamin A rich, high fat content, would more than meet a day's RDA for many adults for Vitamin A with a moderate portion of approximately 2-3 fish (100 g). As might be expected, the pure eulachon fat contained an even higher Vitamin A content than the whole fish. Kuhnlein (1982) noted the high content of her samples and the ease with which these Natives could meet their daily requirement.

The fatty acid analysis done on eulachon fat indicated a level of 32.5% saturated fatty acids and a 3.5% polyunsaturated fatty acid (PUFA) content. Monounsaturates comprised the largest amounts: oleic (18:1), 55% and palmitoleic (16.1), 5.5% (Fig. 2). Kuhnlein et al. (1982) reports comparable figures for fatty acid content of eulachon fat. She found that oleic fatty acid was the primary fatty acid with a mean content of 54.6%. The second most prominent was the saturated fat, palmitic (16:0), with a mean content of about 18%. This analysis showed a content of 20.5% for palmitic acid. Kuhnlein et al. found the overall total unsaturated fat content to be 65% while these results showed a close 64%.

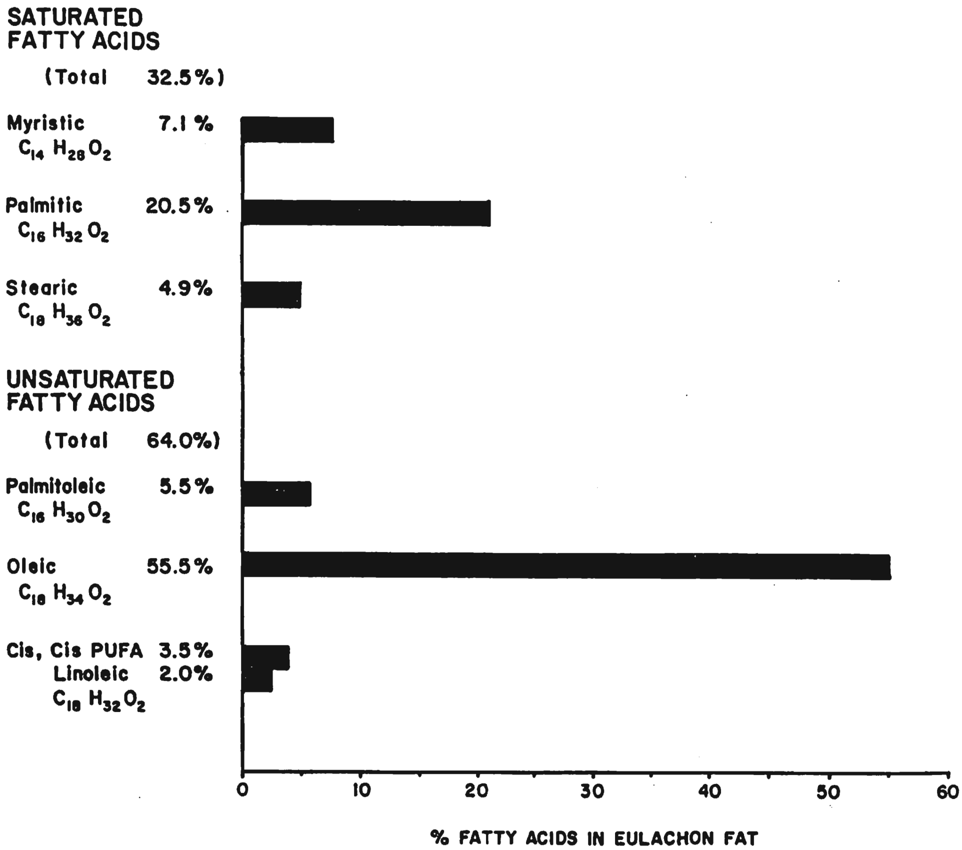

FIG. 2.—Fatty acid content of eulachon fat.

Fish and marine mammals have attracted wide interest recently because many contain fatty acids with long carbon chains of up to five and six double bonds and the Ω-3 configuration. Eicosapentaenoic acid in particular has been cited (Dyerberg et al. 1975, Harris and Conner 1980, Bronsgeest-Schoute et al. 1981).

In this analysis, an AOAC procedure primarily intended to measure degree of unsaturation was used. The procedure provided quantitation for linoleic acid which amounted to 2%. The remaining 1.5% (of the total 3.5% PUFA) was not identified and could possibly have included some eicosapentaenoic acid. Here again Kuhnlein et al. (1982) results were very similar. In this report total percentage of all fatty acids does not equal 100%. At the time of these analyses, little information on fatty acid content of many marine species was available and no standard had been developed for eulachon fat. For this reason laboratory procedures were not prepared to determine the possible presence of odd numbered, long-chain fatty acids. It is possible there may have been some. Also, there may have been unusually long-chain fatty acids present which would not have shown up on the gas chromatogram in the anticipated time period (Fig. 2).

The venison *(Odocoileus hemionus sitkensis)* sample was provided by a hunter from Hydaburg who said it contained more fat than most venison he had seen. However, when one compares the 3.4 g per 100 g of ground venison with the Handbook 8 value of 10.0 g per 100 g for lean ground beef one can see that the fat content of venison is significantly lower.

Because the food samples for these anlyses were collected from a number of different sources, and with the exception of berries, testing was limited to one sample, the data probably should not be used for specific comparisons. However, there is a dearth of nutrient information on foods indigenous to southeastern Alaska and these results do provide basic information which has been urgently needed. If these data are used on a provisional basis until further clarification is available, this study will be of value to those who use these foods.

SUMMARY AND CONCLUSIONS

This nutrient analysis of twenty wild foods eaten by Native peoples of southeastern Alaska provided information which has not previously been available. With the exception of ascorbic acid and thiamin, all nutrients were present in generous amounts. Since a number of local wild foods remain untested, it is possible that these two nutrients could be available from other sources.

With the prospect of increased nutritional information about foods of the area and the great local interest, every possible measure should be taken to ensure their environmental protection. At the same time, it seems appropriate to encourage their continued use by Native people.

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