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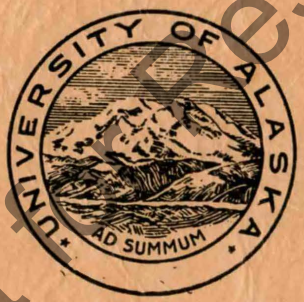

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BLOOD GROUPS OF THE ANAKTUVUK ESKIMOS, ALASKA

W. S. LAUGHLIN

At the invitation of Dr. Kaare Rodahl, Director of Research, Arctic Aeromedical Laboratory, Ladd Air Force Base, Fairbanks, Alaska, a blood group study of the Eskimos living at Anaktuvuk Pass was undertaken. Between December 17 and 24, 1955 a total of 43 members of this small village were typed for presence of the antigens of the A, A_1, B, O system, the MN system and for three antigens of the Rhesus system: Rh_0 (D), Rh′ (C), and Rh″ (E). A description of the sample, in terms of genealogical relationships and birth places, was collected. Subsequent to the typing of the bloods in the village the gene frequency ratios were computed, analyses of the inheritance inside families was made and, lastly, the frequencies were compared with those of other Eskimo groups. Mr. W. O. Tilman and Airman R. Spencer provided indispensable assistance.

OBJECTIVES OF THIS STUDY

The primary objectives of this study were:

1—Performance of agglutination tests on all available Anaktuvuk Eskimos and computation of the gene frequency ratios from the numbers of persons reacting with the various sera.

2—Description of the sample by means of genealogies and birthplace.

3—Examination of those questions for which this blood group information is pertinent. Such questions are:

(a) Are these people Eskimo or Indian?
(b) Is there evidence of Indian or European admixture?
(c) Have these people drawn their genes from coastal Eskimos or preceding groups of inland Eskimos?
(d) In what ways do their genetic composition affect the validity of biological comparisons with other groups?

Since the inheritance of the blood group genes is precisely known, the estimates of intra-group and inter-group variability based upon their distribution with in-groups and between-groups provide the most accurate base for the kinds of questions listed above.

LOCATION AND DESCRIPTION OF THE ANAKTUVUK BREEDING ISOLATE

The Anaktuvuk Eskimos live in a village at the south end of Anaktuvuk Pass (151° 40′ west longitude; 68° 10′ north latitude, approximately 2250′ altitude), some 87 miles north of Bettles, and 252 miles southeast of Point Barrow. Anaktuvuk Pass lies in the Brooks Range mountains of northern Alaska and constitutes one of

the important passes through which the caribou migrate from the interior to the north slope draining into the Beaufort Sea. Anaktuvuk is a cartographic corruption of the Eskimo term "anaqtuavik," which means literally: anaq/feces, tua/having many, vik places of. Though this village was founded as recently as 1951, it now has nine permanent houses and a post office, and can, therefore, be considered a stable Arctic Eskimo village. The members of this village constitute a breeding isolate in that they are biologically self-sustaining and exchange genes more frequently among themselves than with other Eskimos. To what extent this condition has obtained in the past is an important historical question. Since we are concerned with the human biology of this group of people, we shall refer to it as an isolate, indicating that it is a segment of a larger breeding population.

Outlying camps are still used for summer hunting in the traditional fashion of all Eskimo and Aleut villages. Two families were spending the entire winter at a camp, Tuluak (raven), some sixteen miles to the north of Anaktuvuk. Whether or not the people at Tuluak habitually live at that place, as long as their mates are drawn from Anaktuvuk they will be, genetically, a division of the Anaktuvuk isolate. For biological considerations it will be necessary in all future studies to assess the membership of the Tuluak camp and all similar camps. If it should be found that the membership does not rotate but depends upon continuation of existing family lines now living there, then it must be considered a sub-isolate.

Along with other Eskimos who lived in various parts of the interior of Alaska, including the Alaska Peninsula, the term Nunatagmiut (people from the interior) has applied to the Anaktuvuk people by coastal Eskimos. This term is sometimes contracted to Nunamiut, though in this form it ceases to have as much meaning. The point to be emphasized here is that the application of this term to the various interior Eskimos must not be taken to imply a genetic homogeneity among them, nor does it imply any long time genetic continuity for any one of these groups. There does not appear to be any over-all entity of "inland Eskimos"; wherever a group of Eskimos lived interior to their coastal relatives they were referred to by the coastal group as people from the interior. In each case they had their own name for themselves and spoke the same dialect or a close variant of the adjacent coastal group. Thus, it is important for comparative studies that the exact affiliation of each group be determined and that they not be pooled into one series. Different groups may be pooled if they were actively exchanging genes, as in the case of the diverse groups represented in this new isolate.

The Anaktuvuk isolate is composed of at least two interior bands, plus a number of individuals from both the interior and the coast. The number of bands fluctuated as they merged with each other or moved to the coast. Consequently, the number referred to by different observers depends on the time with which they were concerned. The component Anaktuvuk bands have variously been referred to as the Tulugarmiut and the Ki'lirmiut, or the Killik of Anaktuvuk Pass

(Bergsland, 1956; Solecki, 1950). According to one Anaktuvuk Eskimo the present village was formed of two groups. One consisting of four men, and their families, who moved from Chandler to Tuluak to Anaktuvuk. The two families wintering at Tuluak in 1955 were members of this group. The other group consisted of six men and their families who moved in from Killik. However, this informant was referring only to the groups at the most recent points of departure leading to their present location. These were not genetic or linguistic units of long standing.

The census of the summer of 1955 lists seventy-eight living persons (45 males, 33 females) and twenty-four different birthplaces. Geographically these places range from Barter Island and the headwaters of the Firth River to the drainage area of Kotzebue Sound, including such places as Demarcation Point, Cross Island, Chandler Lake, Tuluak Lake, Anaktuvuk Pass, Killik River, Colville River, Kobuk River, Noatak River and Barrow. In order to size the largest numbers came from the Colville River, 14; Anaktuvuk, 13; Killik River, 11; Chandler Lake, 5; and Barrow, 5.

In view of the fact that many of these people had been living on the coast following the depopulation of the north slope around the turn of the century, it is important to see where the older people came from. If we note only the husband and wife of each of the fifteen families listed in the census, the resulting sample of older persons, including two deceased wives who bore children, is drawn from fifteen places but none from Tuluak Lake or Anaktuvuk. Seven come from the Colville River, four from Barrow, three each from the Killik River, Sheenjih River, Demarcation Point, and the remaining ten were each born in a separate place.

It is possible to refine this even further. Only seven lineages are present, utilizing the males. It is not possible to determine precisely to what extent these seven may be related to each other. We may assume that they are sufficiently unrelated to avoid duplication in counting their genes. Their dates of birth and birthplaces are: 1—1882, Noatak River; 2—1885, Wild River; 3—1904, Barrow; 4—1880?, Killik River; 5—1900, Killik River; 6—1893, Turning River; 7—1900, Killik River. Fortunately we have the blood types of five of these founding fathers and, therefore, know that all the major types are represented: three A_1, one B and one O.

With reference to their wives, the man from the Noatak River married a woman born on the Colville in 1896. The man from Turning River married a woman born at Chandler Lake in approximately 1898. The man from Barrow first married a woman from Killik, and after her death married a woman born in 1919 near Barrow, a daughter of the man from Wild River. One of the men from Killik married a woman born on the Turner River and another man from Killik married a woman born in 1919 at Demarcation Point.

We may epitomize the foregoing data by noting that the membership of this isolate is diverse in origin, that none of the original or older members came from either Tuluak Lake or Anaktuvuk and that there

is a relatively large component of persons who were born somewhere in the interior of Alaska, but whose parentage cannot be assumed to be exclusively interior. In addition to the component from the interior there is a large proportion born in coastal villages and from places in regular and direct contact with coastal villages.

DESCRIPTION OF THE SAMPLE BLOOD TYPED

The 43 persons tested consist of 26 males and 17 females. The males range in age from less than one year to over 74, with a mean age of 25. The females range in age from 2 to 45 with a mean age of 22. It is not without interest that the oldest woman is 45, whereas the four persons above this age are all men.

Four generations are represented with 4 men in the oldest generation, 10 males and 10 females in the second, 11 males and 6 females in the third, and 1 male and 1 female in the fourth generation. The actual degree of relatedness is increased by the marriage of one man, listed with the first generation on the basis of age only, to two daughters of two men of the first generation. Genetically, his children and grandchildren are grandchildren and great-grandchildren of the first generation on their mother's side. His second wife had also had a previous marriage. Consequently we are able to deduce the genotypes of two additional persons who are now deceased or living on the coast. The family line to which this second wife belongs is of especial importance because it has contributed all the B genes to this isolate. There is one other person, in addition to the older man from Barrow, who has come from the outside and married into the second generation living here. This is a female of type A whose parents lived at Beechey Point on the north coast, some 174 miles from Anaktuvuk.

The twenty brothers and sisters of the second generation are the offspring of four men of the oldest generation. The seventeen brothers and sisters of the third generation are the offspring of nine matings of members of the second generation. All the persons in the sample are comprehended under five family names.

TECHNIQUE OF TESTS

Specimens of blood, consisting of a few drops, were taken from the ear into a Wasserman tube containing 2 cc. of physiological saline. Tests using anti-A and anti-B were performed in well slides using this 3-5% suspension. These specimens reacting with anti-A were then tested with anti-A_1.

For the MN and Rh tests the cells were washed. Tests with anti-M and anti-N sera were performed in well slides, those with anti-Rh_0 (D), anti-Rh′ (C), and anti-Rh″ (E) were carried out in blood group tubes with one hour incubation at 37.5° C. Tests with anti-Hr′ (e) were performed only on well slides.

All negative and weak reactions were examined under the low power of a microscope. As an added check thirty of the Rh′ (C) and Rh″ (E) tests were repeated. As a check on the A_1 reactions a

specially prepared serum provided by Dr. Margery P. Gray, Memorial Affairs Division, USAAF, was used on fifteen blood specimens. All other sera were supplied by Dr. A. S. Wiener.

The A B O Groups

The first point of major interest is the low percentage of group O persons, and the low frequency of the gene r for this blood type. The second point of interest is the high frequency of groups B and A_1B. It appears that the frequency of B has increased at the expense of the frequency of O, whereas the frequency of A_1 has remained within the range of frequencies commonly found in most larger Eskimo populations proviously typed.

	Phenotypes				Genes %		
	O	A_1	B	A_1B	r	p	q
Observed number	6	23	11	3	42.74	38.55	18.56
Expected number	7.86	20.56	8.30	6.15			
Observed percent	13.95	53.41	25.58	6.98			
Expected percent	18.25	47.81	19.31	14.31			

All persons of group A proved to be division A_1. Eskimos, American Indians and Asiatic Mongoloids appear to lack the allele for A_2 in contrast to European and African Negro populations where A_2 may constitute 25% or more of the total A alleles. Presence of A_2 in the Anaktuvuk sample would have been presumptive evidence of European or Negro admixture.

Owing to the fact that B is absent in North American Indians there is no question about the correctness of classifying these people as Eskimos.

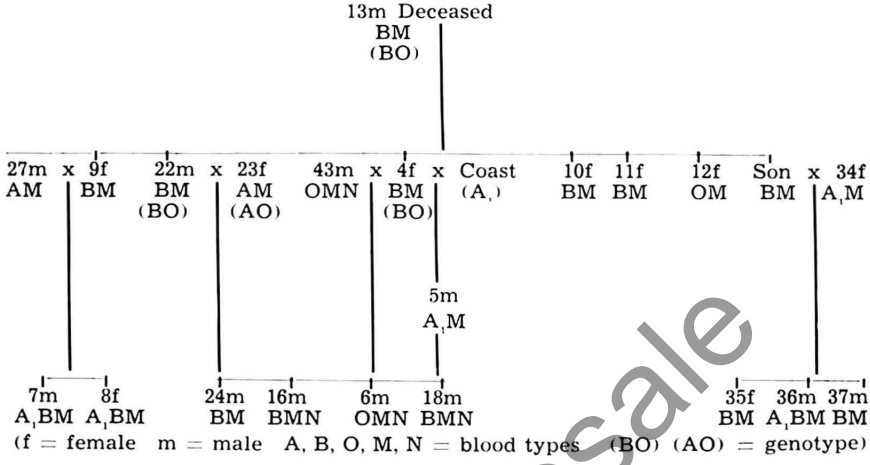
The sample is small, as is the isolate which it represents. In addition there is a high degree of relatedness within the sample. As a consequence the gene frequencies are more subject to accidents of family size than in a larger population. Only six persons in this sample have no genetic relationship to each other. Taking one person from the family which is unrelated to the other four families, the four men of the first generation and the female from the coast who is unrelated, we have four of type A_1, one of B and one of O. The resulting proportions would be similar for O, higher for A_1 and lower for B.

These frequencies were calculated using the Bernstein's equation, with corrected values as recommended by Mourant, 1954, pp. 215-219.

Inheritance of ABO Groups in Family Lines

Of the five family lines represented, two had seven children, one had four children, one had three children in the second generation. The fifth family line resulting from the marriage of one man with one daughter from each of the two largest families, has three children from one marriage and two from the other. The effect of these disproportionate size families in such a sample is of considerable interest. It has raised the relative proportion of type B by a large amount. Accordingly all of the B genes (q) in this sample belonging to 11 type B and 3 A_1B persons may be traced to one first generation mating.

GENEALOGICAL TABLE



(f = female m = male A, B, O, M, N = blood types (BO) (AO) = genotype)

A number of deductions are possible from this family line. It is obvious that number 13 was heterozygous for B, and equally obvious that his wife must have had at least one gene for O. It is equally apparent that at least some of the children are heterozygous. For example, the A_1M child resulting from the mating of 4f with a man from the coast indicates the heterozygous condition of the mother and permits us to deduce the A1 type of the father. This family line is of further importance owing to the fact that the founder, number 13, and his deceased wife, are of interior parentage.

Comparison of Anaktuvuk with North Alaskan and Canadian Isolates

A most valuable series of Mackenzie River Eskimo has been typed by R. R. Gates. Although it is too small to be of use for relative frequencies, it clearly establishes the presence of blood type B in that area to the east of Anaktuvuk (Gates, 1929). At the same time this series also gives valuable information on the location or movements of the Eskimos from the interior of Alaska. Sixteen persons were typed at the school at Hay River and at Aklavik on the delta of the Mackenzie. Listed by birthplace they are:

	O	A	B	AB
Alaska			1	
Herschel Island			2	
Mackenzie Delta	2	2	1	
Nunatomiok family	1	1	2	
Kittigazuit				1
Baillie Island	1	1	1	
	4	4	7	1

The possibility that the "Nunatomiok family" or the one person

from Alaska are represented in the Anaktuvuk sample, at least by means of relatives, is a real one.

Aside from this small series there are series of Eskimos from Point Barrow and Nome which are especially pertinent in view of the likely fact that the interior Eskimos have been drawing genes from both of these groups. In addition, Indians in Alaska and on the Mackenzie have been typed and provide good evidence that blood type B was not present in North American Indians.

		Phenotype Percentages			
ESKIMOS	No.	O	A	B	AB
Anaktuvuk. W. S. Laughlin	43	13.95	53.41	25.58	6.98
Point Barrow (pure). Levine (1950)	329	40.73	47.11	9.73	2.43
Nome (pure). Levine (1950)	254	43.31	42.52	11.81	2.36
Bethel. Matson and Roberts (1949)	341	36.95	44.87	11.73	6.45
INDIANS					
Lower Mackenzie. Gates (1929)	71	84.5	15.5	0.0	0.0
Tlingit. R. B. Williams (1953)		75.8	24.2	0.0	0.0
Alaskan. Pauls, Victors, Dodson (1953)	333	60.96	36.34	2.40	0.30
British Columbia. Chown and Lewis (1952)	394	80.96	18.27	0.76	0.00
British Columbia. Gates (1934)	300	86.70	12.70	0.60	0.00

On the basis of present evidence the distinction between Eskimos and Indians appears well marked. Indians do not regularly possess group B. It should be noted that to the east of the Mackenzie River the Central Eskimos, including the Polar Eskimo of far northern Greenland, have little or no group B. Group B is found again in varying frequency on the west coast of Greenland and on the south east coast (Laughlin, 1950; Mourant, 1954). The distribution of the major blood groups of the Eskimo can be summarized by noting that in the areas of continuous distribution group B is present in all the samples tested. The areas of continuous distribution are the Alaskan coast, including the Aleutian Islands, to and probably including the Mackenzie Eskimo, and the coast of western and southeastern Greenland. The area of discontinuous distribution is the intervening area including Labrador and the Cape York district of Greenland. Here the population density is very low, and contacts between groups are much more intermittent. It is likely that blood group B has been lost many times from various isolates and replaced when contact and mixture were again reestablished. It is clear that the Anaktuvuk Eskimo belong to the western area of continuous distribution. They may have had a degree of isolation comparable to that of the Mackenzie Eskimos, apparently not enough to lose group B.

The MN Blood Types

The significant point to be noted concerning the MN types of this isolate is the low frequency of the gene for type N. This value (.140) is the low for Alaskan Eskimos. Only the frequency of N in the Western Aleuts (0.049) and in the Angmagssalik Eskimos (0.075-0.087) of east Greenland is lower (Skeller, 1954). This constitutes rather good evidence that there is no European admixture in the Anaktuvuk Eskimos, or that the degree of mixture is so small as to be undetectable.

A consequence of this low frequency is the absence of any persons of phenotype N. All the genes for N are carried by heterozygotes, MN. This absence of individuals of phenotype N has also occurred in the western isolate of the Aleutian Islands. There, a similar sized isolate, numbering 41, has all the genes for N carried in the heterozygous form. A chi square test reveals that there is a very good fit between the observed numbers and the expected numbers.

	Phenotypes							Genes	
	M	%	MN	%	N	%	Total	m	n
Observed	31	(72.09)	12	(27.91)	0.00		43	.860	.140
Expected	31.80	(73.96)	10.35	(24.08)	0.84	(1.96)	42.99		

A chi square value of 1.1321 ($p = .20 - .30$) confirms the observation that the proportions of these genes are within a state of equilibrium. Similarly, the west Aleuts of Attu and Atka display a very good fit when tested with chi square. The western Aleuts are the least mixed of the Aleutian Aleuts. The eastern isolate of Aleuts, Nikolski and Unalaska, show a considerably higher degree of mixture with an N frequency of 0.213.

When compared with the Point Barrow Eskimos, using those designated as "pure" by Victor Levine (Laughlin, 1950) it is interesting to note that there is no significant difference (chi square of 2.48) even though the Point Barrow Eskimos showed a much higher frequency of N. In making such comparisons it must be kept in mind that there were isolate differences before the arrival of Europeans and all the larger N frequencies can not be entirely attributed to admixture. It is apparent that the aboriginal values could range at least from 0.049 to possibly 0.174, the frequency found south of Nanortalik, Greenland where the Eskimos were estimated to be almost entirely pure.

The Rh Blood Types

All persons reacted with anti-D (Rh_o). The presence of Rh negative persons would have provided presumptive evidence of European admixture. In this respect they conform to all other Eskimos, Indians and Asiatic Mongoloids who are free of European admixture. It is apparent that they are high in CDe (Rh_1), cDE (Rh_2) and CDE (Rh_1Rh_2). At least one person of the latter group is probabably CDE/CDE (Rh_z Rh_z). The anti-c (hr′) serum could not be used under optimum conditions and as a consequence it is likely that weak reactions were undetected. The same may apply to a lesser extent for the anti-C (rh′) reactions. All these bloods should be retested with at least two different sera of each kind in order to remove any ambiguity concerning those which frequently give extremely weak reactions.

For comparative purposes the Rh blood types of the full-blooded Eskimos at Bethel, on the Kuskokwim River, as identified by three anti-sera is given (Matson and Roberts, 1949). The Bethel blood types include several villages on the Kuskokwim River, Nunivak Island and the villages of Napakiak and Napaskiak.

		Rh-cde		Rh_1-CDe		Rh_2cDE		Rh_1Rh_2-CDE		Rh_0-cDe	
		No.	%	No.	%	No.	%	No.	%	No.	%
Anaktuvuk	43	0	0.00	10	23.26	10	23.26	23	53.48	0	0.00
Bethel	315	0	0.00	110	34.92	62	19.68	140	44.45	3	0.95

Evidences of Interior People on the Coast

To a certain extent the same people have been referred to as coastal or interior. K. Rasmussen, V. Stefansson and D. Jenness all collected information or measurements of the interior Eskimos, but on the coast. As previously noted R. R. Gates typed interior Eskimos on the Mackenzie River. Thus, they have provided much concrete evidence concerning the relations of these groups and, hence, of the genetic origins of the groups from which the Anaktuvuk isolate is drawn.

Stefansson measured members of six different groups of interior Eskimos on the coast at or near the Colville, Barrow (Cape Smythe), and Point Barrow when they came down to the coast for the whaling season, and at Herschel Island where they also went to contact the whaling ships. These groups included: Nunatagmiut proper, Noatagmiut, Kuvugmiut, Kangianirmiut, Killirmiut and Kagmallirmiut. A seventh group, Oturkagmiut, was classed with the Barrow group (Seltzer, 1933, pp. 319-321).

Of fourteen individuals at Point Hope measured by Jenness in 1913 only four had both a mother and father from Point Hope. One had one parent from Point Hope and the remainder were derived from Oturkaq, Napaqtok, Kikittaruk, Kivallik, K vallinak and Noatak (Jenness, 1923, p. 34B).

When Rasmussen collected a word list for interior Eskimos in 1924 he used a man from the Colville River who was in residence at Icy Cape (Osterman, 1941).

Starvation has undoubtedly been a major factor forcing interior people to the coast. The most recent depopulation of the interior area took place around the turn of the century and has been succinctly referred to by D. Jenness in a footnote of his study, *Physical Characteristics of the Copper Eskimos.*

> "The old coastal inhabitants of northern Alaska and the Mackenzie delta largely disappeared during the last years of the 19th century through the ravages of European diseases. Their places have been taken by natives from inland, those dwelling on the Noatak and Colville rivers going to Point Hope, Barrow and Point Barrow, while the more eastern inlanders drifted out to the Mackenzie delta. At the present time the old and the new coast populations are inseparably mixed, and I am inclined to believe that even Stone's data from the Mackenzie delta may reflect this inland element." (Jenness, 1923, p. 48B)

Rodahl notes that in 1907, starvation forced most of the interior people to the coast, primarily to Point Barrow and to the east. He further notes that in 1935, seven or eight families of the coastal Eskimos from the area between Barter Island and the Canadian Arctic, including some originally interior people, started back into the moun-

tains by way of the Colville and Killik rivers and reached Anaktuvuk Pass in 1941 (Rodahl, 1952).

A basic insight into the relation of coastal and interior Eskimos is provided by linguistic evidence. On the basis of a preliminary examination of linguistic materials collected by Helge Ingstad at Anaktuvuk Pass, K. Bergsland has provided the following communication:

> "The main bulk of the material is due to the now well-known Simon Paneaq and his father-in-law, Elijah Kakinnaaq, both belonging to the eastern group of the Nunamiut, the Tulugarmiut of Anaqtuuwak Pass. The informants stated to Ingstad that their language is the same as that spoken by the Napaaqturmiut, the Noatak people, and the former Utuqqarmiut, the people on the Utukok River. In fact, two of Paneaq's great grandfathers were Utuqqarmiut, and of his great grandmothers one was from Pt. Hope and two from Kobuk River. Of Kobuk descent is also another of the Tulugarmiut represented in the material, whereas the western group, the Ki'lirmiut, is represented only by an immigrant from Pt. Barrow.
>
> Anyhow, the available material does not seem to indicate any linguistic cleavage between the inland and the coast. The dialect of the Nunamiut is essentially the same as that of the North Alaska coast and does not seem to have anything particular in common with the inland dialect of the Caribou Ekimos—other than the obvious fact that both are typical Eastern Eskimo dialects." (Knut Bergsland, private communication of August 17, 1956)

Some of the interior people went annually to the coast. Umiat, the name of a village on the Colville, is a plural form of umiak and notes that this was the place where the umiaks were stored. Above here travel was by means of foot and dog sled. Sufficient accounts of the trade routes and of the congregation of different groups for dances have been given in the literature to substantiate the fact that contacts between all the mobile caribou hunters were relatively frequent.

In consequence of the close connections with coastal Eskimos, either directly or indirectly, the possible effects of random genetic drift or of any high degree of isolation may be discounted.

SUMMARY AND CONCLUSION

1. The presence of blood type B has been established in the interior Eskimos of Alaska.

2. The closest Eskimos for whom data exists, Pt. Barrow, Nome, Bethel, and Mackenzie River all have varying frequencies of B. The Indians of Alaska and the Mackenzie River either lack B or have an extremely small amount, most likely attributable to admixture with Whites or Eskimos.

3. The Anaktuvuk sample contains many related people, only six persons are not known to be related to each other. The extent of relationship has not been provided for other groups with whom they may be compared.

4. The Anaktuvuk Eskimos fit within the framework of the western Eskimos who have a relatively continuous distribution and high population density in comparison with the Central Eskimos (Kroeber, 1939). That they retain blood group B and a high proportion of A is contributing evidence to the fact that they have maintained direct and indirect contacts with other western Eskimos.

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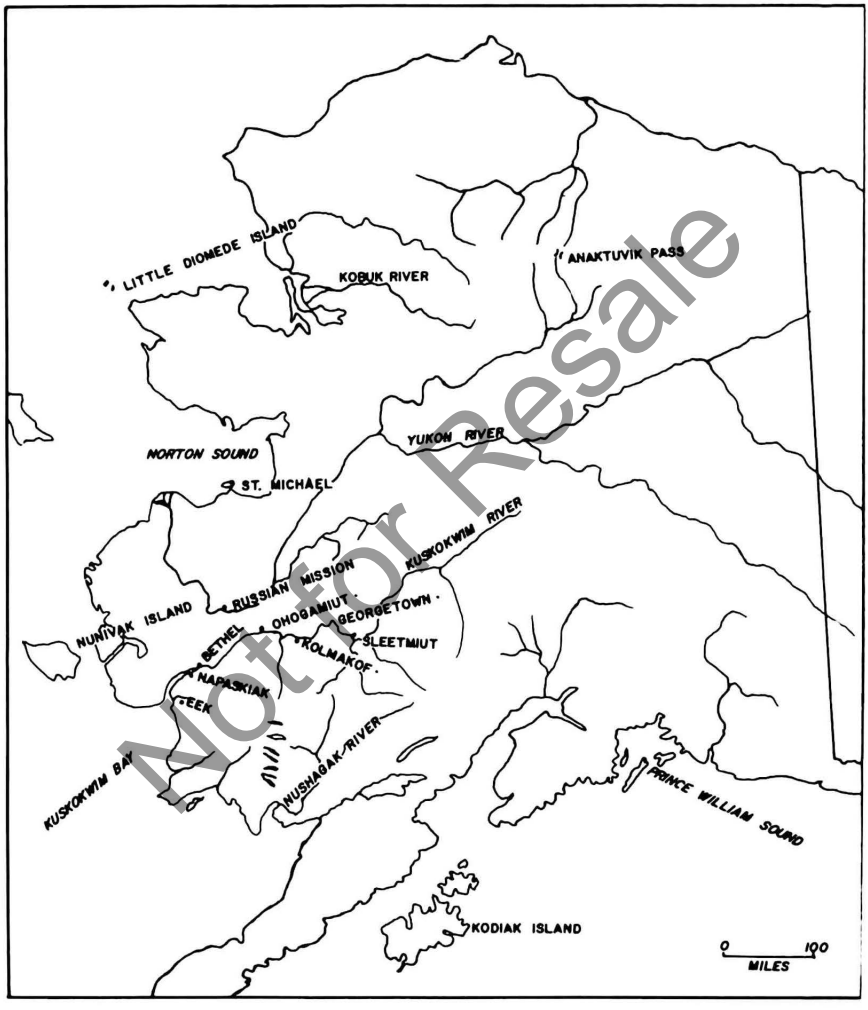

Areas referred to in "A Western Eskimo Ethnobotany"

A WESTERN ESKIMO ETHNOBOTANY

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It is frequently noted that a fine adjustment exists between an Eskimo and his environment. By this is generally meant that animal products are utilized quite fully, but the fact that plant products can play a significant part in Eskimo subsistence patterns is ignored. At least some Eskimo groups utilize plants as foods, medicines, ceremonial equipment, or raw material for manufactures, and these groups may have a systematic body of botanical knowledge. This paper defines the botanical knowledge and general range of plant uses among the residents of Napaskiak, a Western Eskimo village; also included is a brief consideration of ethnobotanical knowledge among Alaskan Eskimos in general.

BACKGROUND INFORMATION

The field data for this study were collected at Napaskiak, a village on the south bank of the lower Kuskokwim River seven miles downstream from Bethel. The people of Napaskiak belong to the group of Eskimos known as the Kuskokwagmiut, who live along the Kuskokwim River from the inland village of Sleetmiut to the shores of Kuskokwim Bay. These people speak a dialect of the Yupik Eskimo language family, which is one of the many Yupik dialects spoken in western and southern Alaska by Eskimos living from Norton Sound to Prince William Sound (Swadesh, 1951, pp. 66-70).

Ecologically, the habitat of the Kuskokwagmiut is quite varied. The people along the middle course of the Kuskokwim River live in an area dominated by stands of white spruce; those along the lower river are in an environment in which there are scattered and stunted stands of spruce, willows and alders bordering the river, with open tundra country farther away from the river. The people along Kuskokwim Bay live in an area dominated by open tundra although there are stunted willows in sheltered depressions.

Contact with the Russians and Americans came late to the people of the Kuskokwim. The first Russian explorations along the river did not occur until 1829, when Vasilief ascended the Nushagak River, crossed the divide to the Holitna River, and descended it to the Kuskokwim River proper. In the early 1830's the Russian trading post of Kolmakof was established; it soon became the principal trading center on the river and remained important during the balance of the Russian occupation (Brooks, 1953, pp. 227-35). Shortly after the United States purchased Alaska, American traders established themselves on the lower Kuskokwim River at a small Russian trading center later to become known as Bethel (Kitchner, 1954, pp. 161-86). The first notable explorations along the lower Kuskokwim River were made by the great naturalist E. W. Nelson (1899, p. 19), who, in 1878 and 1879, traversed the tundra country between the mouths of the Yukon and Kuskokwim rivers and ascended the Kuskokwim as far as the vicinity of Ohogamiut before returning to the Yukon River and St. Michael.

Today, Napaskiak is a village of nearly 150 persons. The people subsist primarily upon salmon but trap mink and hunt muskrats in order to buy trade items. In the village there is an Alaska Native Service school, established in 1939, which at present has an enrollment of 35 children. Although there is no store in the village, the Oscarville Trading Post is just across the river, and only a short distance away is the trading center of Bethel. Virtually everyone in the village is an active member of the Russian Orthodox church, which won its first village converts in 1905. The village has an Orthodox church, built in 1931, but does not have a resident missionary.

Traditionally Napaskiak is a long established village, although there are stories that before moving to their present location the villagers lived at one of two abandoned villages a mile above and two miles below the present location. The people of Napaskiak consider their nearest blood ties to be with the people from Eek, Napakiak, and Kwethluk, as well as from the now-abandoned villages of Painuk, Akulurak, and Loamavik.

METHOD

During 1955 and 1956 I carried out an ethnographic community study at Napaskiak, and the ethnobotanical information presented here was collected during that time. In the spring of 1956 I gathered plant specimens from the vicinity of the village and after extensive inquiry learned that Mrs. Anissum Jacob was reputed to know a great deal about the flora. Mrs. Jacob was born nearly fifty years ago in the nearby down river village of Eek and has lived all her life in the Eek-Napaskiak region; she agreed to tell me all she could about the plants I had gathered. One by one the specimens were discussed, and the informant was encouraged to relate any information she thought pertinent. After the discussion of the collected specimens had been completed, Mrs. Jacob gathered and identified all the plants I had missed or could not locate. It is difficult to determine what percentage of the total local vegetation is represented in this collection, but I would estimate that 85% of the local vascular plants were gathered. In addition to the plant discussions with Mrs. Jacob, Mr. Willy Jones helped identify some of the plants. Mr. Jones, a man of seventy-two, was born near Eek and has lived most of his life in Napaskiak and, like Mrs. Anissum Jacob, is a keen observer. Mrs. Marie Jacob, a woman of nearly seventy, who was born in Napaskiak, supplied additional details concerning certain plants. Further information was obtained during the course of the community study either through direct observation or casual interviews with various village residents. After all the raw data had been organized, the Eskimo names and identifications were checked with Mrs. Mary McDougall, the Alaska Native Service teacher at Napaskiak. Mrs. McDougall was born at Napakiak, seven miles down stream from Napaskiak, and has lived in this general area most of her life. She is a college graduate who speaks Eskimo with as much ease as she does English. Her assistance was invaluable in making a

final check on the identifications, in translating the Eskimo names into English, and in clearing up obscure or ambiguous points.

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THE BOTANICAL SYSTEM AT NAPASKIAK

The Napaskiak people often think of a plant in terms of some characteristic feature, and from this the name is derived. For example, the Eskimo name of the high bush cranberry (for botanical names see the text), means the berry that holds a lot of water; the name of the curled shield lichen, is translated, would like to be stretched: the arctic iris leaf looks like an iron knife blade, and the plant is so named in Eskimo. Seventeen plants have Eskimo names which cannot be translated into English. There are two or perhaps three that have two names for a single species, one name having an English translation and the other without a translation. Nine plants have no specific Eskimo names, although they are known to grow in the vicinity of the village. The plants are referred to simply as *nunau'sluk,* translated as a piece of earth. All informants were genuinely surprised that there were so many plants near the village for which they had no specific names and excused the fact by saying that they never use these plants. It should be noted also that some plants which we would class in different genera are lumped under one Eskimo name; for example, bluebells, valerian, and yarrow are all termed *puniyulinu'kite,* or bumblebee food.

In general, the stem of the plant is termed an *u'poa* or handle; thus, the wild rose plant as a whole is called *tutukoau'poa,* whereas the rose hip, from which the plant is named, is called *tutu'koak.* The general term for plant leaves is *chu'kut,* for branches, *a'vayat,* and roots *ach'kot.*

The people of Napaskiak have no concept of plant fertilization, but they often make their own distinction between male and female plants or parts of plants; however, the system is not consistent. In general, the flowering part of a plant is considered to be male, while the leaves are regarded as female; there are cases, however, in which one plant is considered male and another female. In the case of a plant like sour dock, the mature flowering or seeded plant is called

angu'kuk or male; the plant before it matures has a different name and is considered to be female. Again, the growth of tall cotton grass without flowers is consistently associated with the female sex. The lichens, horsetail, woodfern and mosses are not classified by sex.

The Alaska Native Service teachers have attempted to introduce gardening to the villagers, and the present teacher has a small plot of radishes, strawberries and lettuce; however, the only gardens maintained by villagers are two small turnip patches cultivated by two separate famiies. In some of the houses are a few potted pants, none of which has acquired Eskimo names.

THE COLLECTION

The descriptions which follow are of sixty-eight plant specimens from the vicinity of Napaskiak; comments are also made upon birch fungus and tobacco which are locally significant but are imported. In so far as possible the flora have been grouped by their primary use.

In the text each species is designated by its binomial botanical name, a common name, the Eskimo name or names, and a translation into English of the Eskimo term. Following this information are comments upon uses of the plant at Napaskiak. Throughout the text the past tense has been employed if the plant being described is no longer used; if the plant usage is current, the present tense is employed. If the usage is known to have resulted from historic contact, this fact is acknowledged.

Following the data on each plant are comparisons with reported uses of the same or similar plants among other Alaskan Eskimos. The comparative material is drawn largely from the Bering Sea Eskimo (Nelson, 1899; Lantis, 1946, 1947) and the reports of Anderson (1939), Heller (1953), and Birket-Smith (1953). No attempt has been made to include a comparison of all reported Alaskan Eskimo plant usages; comparisons that have been made are largely in terms of the Napaskiak collection.

FOODS

The plants used as food in Napaskiak are prepared for consumption in five different ways. The berries, rose hips, willow and fireweed leaves are eaten raw, and the two lichens are used as flavorings. Dried fireweed leaves were used to brew tea. Eight different plant leaves or stems are prepared by simmering or boiling the edible part in water. After being cooked, these plants are added to soups or stews of fish or meats. One species of sour dock is eaten with seal oil.

The salmonberry is the most important plant food, and all other berry picking is incidental to the gathering of this species. The berries are occasionally eaten raw but usually serve as ingredients for *agu'tuk*, which is often called "Eskimo ice cream". *Agu'tuk* is usually made from seal oil and commercial lards mixed with berries, a little sugar, boiled fish and certain greens such as sour dock, horsetail, mare's tail,

or woodfern. The combination of ingredients varies with the season, but berries and oil are the basis of the dish. In the winter *agu'tuk* is stored in the cold so that the oils congeal, and it is served in a solid state. *Agu'tuk* is a favorite dessert at Napaskiak, and an adult usually will consume two to three measuring cups full at a sitting.

Arctostaphylos alpina (L.) Spreng., alpine bearberry; *Ka'vuluk,* hoarse voice.

The berries from this plant are picked when people are gathering salmonberries, but they are not specifically sought and have no special uses.

Anderson (1939, p. 715) reports that these berries are used only slightly by the people of the northern coasts, and Heller (1953, p. 77) states that bearberries are picked and mixed with blueberries in a poor berry year.

Cetraria crispa (Ach.) Nyl., shield lichen; *aouk',* no known translation.

These gray green plants were chopped up and added to various types of soups for flavoring, but there was no other use known.

Cetraria cucullata (Bellard) Ach., curled shield lichen; *ningyu'yuk,* would like to be stretched.

This lichen was added for flavoring to soups of fresh fish or ducks. It was not often used alone as a food and is primarily recognized as a reindeer or caribou food.

Hawkes (1913, p. 14) records lichens as one of the foods consumed during the ceremonials he attended at St. Michael.

Cicuta mackenziana Raup, poison water hemlock; *tunuk'alok,* something that is rather hard.

The green leaves are cooked in water with fresh fish, but the plant is not used otherwise. The roots, described as bulbous, are never eaten since they are considered to be poisonous to people. However, it is said that small rodents eat the roots and suffer no ill effects.

Heller (1953, p. 153) classes this species among the poisonous Alaskan plants and notes that two deaths in the Bethel area in 1951 were reported to have been caused by eating this plant. Poisonous plants were not used in hunting or fishing in the lower Kuskokwim River region, nor were they on Nunivak Island (Lantis, 1946, p. 172).

Dryopteris austriaca (Jacq.) Woynar, woodfern; *wingi'suk,* no known translation.

During the summer the roots of this fern were occasionally collected, boiled in water, and added to *agu'tuk.* In recent years the leaves of the woodfern have been used to decorate the inside of the church and the graves in the cemetery on certain church holidays. No sex distinction is recognized in this plant.

In an account of Davidov's, cited by Lantis (1947, p. 61), ferns were described as having adorned some of the ceremonial masks used by Kodiak Island Eskimos.

Empetrum nigrum L., crowberry; *tanu'kupuk,* blackberry.

These berries are sometimes picked and eaten, but they are not preserved. According to Napaskiak informants, the people living along the adjacent Bering Sea coast brewed tea from this plant, using the entire plant.

Crowberries have a limited use along the northern coast of Alaska (Anderson, 1939, p. 715), and Heller (1953, p. 79) notes that Eskimos mix them with other berries.

Epilobium angustifolium L., fireweed; *chis'kuk,* stiff or hard.

Fireweed leaves are sometimes gathered and eaten raw; more often they were gathered and dried to be used in tea in the fall and winter. While green, the leaves may also be used in a meat or fish stew. There is no sex distinction recognized in this plant. Along the northern coasts of Alaska fireweed leaves are collected and usually boiled with *Rumex* sp (Anderson, 1939, p. 715).

Equisetum arvense L., horsetail; *taiyaoluing'uk,* no known translation.

The small black nodules that grow on the roots of horsetail, as well as the roots themselves, are ground up while green and mixed into *agu'tuk.* They may also be mixed with fish eggs and made into a soup. There is no sex distinction recognized.

Hippuris vulgaris L., mare's tail; *taiya'ok,* no known translation.

In the early spring the upper stems of this plant are often gathered from the top of the ice areas where the plant had been growing in shallow water the previous year. The stems are mixed into soups of all sorts, as well as into *agu'tuk.* They are considered to be quite flavorful and are also gathered later in the summer when the plant is green and growing.

Heller (1953, p. 135) notes that along the lower Kuskokwim mare's tail is always cooked with seal oil and occasionally mixed into soups of fish eggs, tom-cod livers, and seal meat or seal blood. On Nunivak Island the people gather this plant and eat the shoots raw or mix them with seal oil and salmon eggs (Lantis, 1946, p. 178).

Matricaria suaveolens (Pursh) Buch., false-camomile; *atsu'koak,* like fruit.

When this small plant begins to bloom along the village paths, the people say it is time to go to the tundra and pick salmonberries, for the false-camomile blooms and salmonberries ripen at the same time. In the summer the children habitually eat the stems raw; adults do likewise but less frequently. The seed head was gathered in the

fall and dried for winter; if someone had a cold or indigestion, these seed heads, cooked in water were given for relief. In the summer the men often gather a handful of this plant, stems, flowers and all, to put in the hot water container in the steam bath house so that the odor of the plant will permeate the air during the bath, since it is an aroma that most of them enjoy.

Ranunculus lapponicus L., marsh marigold; asl'koak, no known translation or *asing'oat,* looks like a patch.

The leaves of this plant are female, and the blossom is male. The blossoms are called lights because of their bright color. The leaves and stems are collected before the plant blooms and are cooked in a stew with ducks or fresh fish. Formerly, persons who had been starving for a long while ate some of these plants which had been soaked in water before eating other food.

On Nunivak Island young *Ranunculus* roots and shoots were gathered and eaten raw (Lantis, 1946, p. 178).

Rorippa palustris (L.) Besser, marsh cress; *kakachoku'nuk,* looks like something that rattles.

Marsh cress is occasionally gathered, in June, and is cooked with fish in water. This species is considered to be male in sex, while the female plant with the same Eskimo name is *Taraxacum* sp.

Rosa acicularis Lindl., wild rose; *tutuk'oak,* no known translation (the name refers to the rose hip specifically).

The wild rose hips are eaten raw in the late fall and early spring, but the plant has no other use. The children are cautioned not to eat too many, for to do so is said to result in a severe stomach ache.

Rubus arcticus L., nagoonberry; *puma'kak,* looks smoky.

These berries are picked and mixed among salmonberries when the latter are stored in barrels for the winter. Nagoonberries grow all around the village, but they are not specifically sought no picked in any quantity. The old people say that eating too many will cause a severe stomach ache.

Rubus chamaemorus L., salmonberry; *at'sut,* berries or fruits.

The salmonberry is beyond any question the plant food most important to the people of Napaskiak. When these berries ripen in the early fall, virtually every family goes by boat to the open tundra country behind the village; here they pick berries for two or three days, or until they have at least two small wooden barrels filled with them. During the course of a winter one family, consisting of a man, his wife and two children, will consume from two to three barrels full (one barrel contains approximately fifteen liquid gallons) of berries in *agu'tuk.*

Fresh or fresh frozen salmonberries are a good source of vitamin C, but if the berries are allowed to ferment or mold, as is common at

Napaskiak, the vitamin C is destroyed. A sample of fresh frozen salmonberries kept in an ice cellar throughout the winter and then tested contained 178 milligrams of ascorbic acid per 100 grams or about ½ cup, which is two and a half to three times the amount in an orange (Heller, 1953, p. 93).

Rumex sp., sour dock; *angu'kuk,* male plant, or *koak'chet,* no known translation.

In its mature condition sour dock is always considered to be male, since each plant has flowers. One species(?) is named "male" in Eskimo; however, immature plants, before they flower, are thought to be female. The leaves and stems of *angu'kuk* are gathered in the early spring; after the greens are finely chopped, they are simmered for more than an hour, cooled, and then added to *agu'tuk.* Some women say that there are too many worms on this plant and will not use it as food. The *Rumex* termed *koak'chet,* probably R. *acetosa alpestris* (Murb.) Murb., is cooked in water for half an hour; a little seal oil and/or sugar may be added then and the preparation eaten. It may also be cooked in water and added to *agu'tuk.* Occasionally the leaves are gathered in mid-summer and placed in a small barrel to be used later in *agu'tuk* or for curing during the winter. As a cure for severe cases of diarrhea, the leaves and stems were cooked in water and given to the sick person before any other food in the morning and again at night; this remedy was reported to cure diarrhea in a few days.

Heller (1953, p. 55) comments that the Eskimos gather R. *arcticus* Trautv. in quantity. It is cooked, chopped, mixed with other greens, and stored in barrels for winter use.

Salix (probably *glauca*), willow; *nuwi'longok,* has no bones.

According to my principal informant, this species does not have any sex, although she acknowledged that some persons consider the male and female forms to be distinguishable; no satisfactory account could be obtained, however, concerning the criteria for differentiation. The new leaves of this willow are often eaten raw in the spring; they may also be added to meat or fish stews and soups. The trunk and heavier branches are sometimes collected for firewood. The small willow branches are collected just before the spring smelt run; after the stems and leaves are stripped from the branches, they are tied together in about six foot lengths. The smelt are then strung through the gills on these skewers and hung to dry.

The Arctic Eskimos collect the inner bark of S. *alaxensis* Cov., and eat it raw with seal oil and sugar. S. *pulchra* Cham. shoots are collected in the early spring, and the inner portions are eaten raw; later in the season the young leaves are eaten raw with seal oil or stored in seal oil for winter consumption. Heller notes that Totter found 544 milligrams of ascorbic acid in about ½ cup or 100 grams of leaves, which means that this species is seven to ten times more effective as a source of ascorbic acid than are oranges (Heller, 1953, p. 61).

Ingstad (1954) in his ethnographic study of the Nunamiut, an Eskimo group of inland caribou hunters living in the Anaktuvik Pass region of the Brooks Range, frequently notes the many uses to which willows are put. He records the ut lization of willow in pipe stems, tent frames, caribou snare poles, and kayak ribs, as well as for firewood and palisades around the hamlet; he finds too that willow cotton was used as tinder in making fires.

Tarxaxacum sp., dandelion; *kakachoku'nuk,* looks like something that rattles.

Dandelion leaves are collected throughout the summer and are cooked in a kettle of water with fish. There is no other use for this plant, and it is not preserved for winter. Before flowering, the plant is considered to be female; after the blossom developes, it is mistakenly considered to be marsh cress, a male plant.

Dandelion leaves are scalded and eaten in north coastal Alaska (Anderson, 1939, p. 716).

Vaccinium oxycoccos L., bog cranberry; *uwing'e,* one that never marries.

One informant suggested that perhaps the Eskimo name is derived from the fact that the plant has insignificant leaves, which are considered by the people as female, but has large berries, which are considered to be male; thus the male berries always appear to be alone. The bog cranberry is only occasionally gathered with salmonberries and is not specifically sought.

Vaccinium uliginosum L., bog blueberry; *chowuk',* no known translation.

Blueberries are abundant in sheltered marshy areas near Napaskiak, but they are not picked extensively. Some blueberries are gathered and mixed into *agu'tuk* during the fall when berries are ripe, but the fact that they do not keep well discourages the people from storing them for winter use. Sometimes blueberries will be mixed into a barrel of salmonberries, and in this way they will keep. At the present time some blueberries are picked and eaten fresh with milk and sugar.

The blueberry is very important to the arctic coast villagers who go inland to collect them (Anderson, 1939, p. 715). In general, the blueberry is used widely by the Eskimos of western Alaska, particularly in localities where salmonberries are not abundant.

Vaccinium vitis-idaea L., low-bush cranberry; *kawik'ulik,* red ones.

The berries are gathered either when they ripen in the fall or in the spring as soon as the snow leaves the ground and before the berries drop to the ground. Low-bush cranberries are mixed into *agu'tuk,* and since historic contact some women have begun to make jam of them by boiling the berries down with sugar.

Low-bush cranberries are reportedly used in northern Alaska;

their importance is not recorded, but it is probably negligible (Anderson, 1939, p. 715).

Viburnum edule (Michx.) Raf., high-bush cranberry; *mukchulu'slpit,* holds a lot of water.

High-bush cranberries grow among the alders near the villages and are picked either as they ripen in the fall or in very early spring while they are still on the plant. High-bush cranberries are not preserved for winter, for they are said to spoil quickly. They are eaten primarily by the children, who, while playing in the vicinity of the village, often pick and eat a few berries. Those that are picked by adults are mixed into *agu'tuk;* today some women also boil them with sugar to make jam.

Plants which have been listed under other headings but which are also used as foods include tall cotton grass, wild celery, and Labrador tea.

MANUFACTURES AND FUELS

This category includes fuels as well as artifacts made from plant products. The wooden artifacts are formed with metal bladed adzes and crooked knives as well as with commercial wood working axes, chisels, saws, and wood planes. For most wood manufactures spruce is preferred, but occasionally cottonwood may be utilized. Woven artifacts such as mats, socks, and coarse sacks are usually made from a sedge, but grasses may be used for such items as boot insole and menses and diaper pads.

The woods consumed as fuels are most often alders or spruce. At the present time most persons use alders. One man estimated that he consumed nearly a sled load of alders daily in heating his eight by sixteen foot frame house during the day in -20° F. weather. It requires nearly two hours to chop the trees, haul the load to the village, and rechop the wood into stove lengths. A few men collect enough driftwood spruce logs to heat their houses; the individual who relies most heavily upon spruce as fuel estimated that about ten logs, thirty-five feet in length, with a basal diameter of about two feet and very little taper, are adequate to heat a twenty by twenty foot house throughout an entire winter when the house is heated only during the day.

Alnus crispa (Ait.) Pursh., alder; *chukfu'koak,* no translation recorded.

Alders are very plentiful in the vicinity of the village and serve as the primary source of winter fuel. The small straight trees are preferred and are cut while green into nine foot lengths to be hauled to the village in a boat or sled.

The bark of *Alnus frutica* Rupr. is used for dyeing reindeer skins, and most authors comment upon this use of alder bark among the western Eskimos (Anderson, 1939, p. 715; Nelson, 1899, p. 117; Lantis, 1946, p. 170).

Betula nana exilis (Suhatch.) Hult., dwarf birch; *chupuaiya'hak,* something you can blow away.

The people may use this plant for fuel if nothing else is available at their spring or fall tundra camp, but otherwise it has no use. No sex distinction is recognized.

Betula sp., birch (no specimen collected); *u'linguk,* no translation recorded.

There is one stand of birch growing a few miles from the village; but these trees are not used. However, birch snowshoes and birch bark containers were said to have been obtained formerly from Eskimos living farther up the Kuskokwim River. Birchbark canoes were important locally, and at the time of historic contact the people of the Napaskiak region obtained them from the Yowhalingoot, an Athabaskan Indian group occupying a few villages in the vicinity of Georgetown.

Eriophorum angustifolium Roth., tall cotton grass; *e'tuk,* no known translation (name for those plants with flowers), *kalukaiya'hak,* little thread (those plants without flowers).

The stems of the non-flowering tall cotton grass are considered to be female and may be eaten from early spring until the ducks leave in the fall. The lower stems are gathered while green and eaten raw, especially by the children. Adults occasionally eat the lower stems raw and often gather the tops into loose bundles for future use. However, more commonly, the flowerless stems are collected in bundles in the late fall after they have completed their growth and have turned gray white. They are thoroughly dried on the top of a house or storage shed and split lengthwise to be used as the warp and weft in weaving mats. This plant fiber makes particularly good mats, socks, coarse sacks, and formerly shrouds since the fiber can endure repeated moistening and drying without breaking. A strip of the dried stem is also placed between the waterproof seams of a skin boot in order to inhibit leakage. When a girl is secluded during her first menses, she is permitted to eat the stems of the female plant. These may be given to her raw or after being cooked in hot water. When tall cotton grass is cooked, the old people say that it tastes just like fresh fish. Tall cotton grass stems, when eaten raw, are considered to be a good medicine for persons in poor general health. By eating the lower stems of female plants, one soon may expect to regain good health.

Heller (1953, p. 131) describes tall cotton grass as being used along the lower Kuskokwim River and notes that mice collect the roots for their winter food; just before freeze-up the people search for these mouse caches and remove the roots. The black outside layer of the root is removed by pouring boiling water over it, and the roots are then eaten with seal oil. The same collecting technique is recorded for *Carex* sp.; a fish is sometimes substituted for the roots that are removed in order that the mouse may survive the winter (Anderson, 1939, p. 715).

On Nunivak Island (Lantis, 1946, pp. 178-81) the grass most used

for mats and baskets is rye grass, *Elymus mollis* Trin., and according to informants at Napaskiak, the type of basket grass used by the Nunivak Island people and those on the adjacent area of the Bering Sea coast is better than what they have. While it is not positive that they are referring to this variety of rye grass, it is suggesively so. Nelson (1899, pp. 39, 43, 202-5, 217) described grass as being used in western Alaska for socks, mittens, insoles, mats, sails, coiled baskets and twined mats.

From Nunivak Island there are descriptions of grass bundles being tied about the body for certain ceremonies, grass being burned to purify objects, and grass braids being used to bind the limbs on certain occasions. The people of St. Michael placed a pseudo snare of grass outside the entrance to a house in which a person had recently died so that the ghost would not return. Thus it seems that certain types of grasses have limited ceremonial importance in the Bering Sea region (Lantis, 1946, pp. 182, 215; 1947, pp. 55-57).

Eriophorum scheuchzeri Hoppe, cotton grass; *king'slkit,* no known translation.

The stems of this plant were sometimes gathered during the summer, dried, and used for boot insoles, but their importance as insoles was negligible and they had no other use.

Picea glauca (Moench.) Voss, white spruce; *mingkot'moak,* like a needle wood.

White spruce is the most useful tree growing along the Kuskokwim River, and while none grows in the immediate vicinity of the village, there are small stunted stands a few miles distant. In the winter the men sometimes cut dead trees from these stands for firewood. More often the spruce logs utilized are those that have grown along the banks of the upper Kuskokwim River, or its tributaries, and have fallen into the river with a shift in the river channel. Such logs frequently drift ashore in the vicinity of the village, particularly after the spring ice break-up or following a period of high water. Whenever possible, the men locate large straight-grained logs and tow them to the village behind their boats. The logs are often used for firewood, but straight-grained trees may be split with wedges and long narrow splints removed for the construction of funnel-shaped fish traps and for canoe or kayak stringers and ribs. The large roots are preferred for the manufacture of net floats, trays, spoons, and dippers and were formerly used for masks, bowls, visors, hunting hats, and buckets. Items made from roots have the distinct advantage of rarely cracking after they dry. Spruce logs are also used in the construction of caches, houses, drying racks, and other structures.

The inner bark of the roots is split into quarter-inch wide sections the length of the root, and these are used as lines; small rootlets are used intact as lines. These are said never to stretch and rarely to break if they are used when still moist; they are particularly useful in binding blades to handles and in repairing tools.

Green spruce needles are boiled in water and used as a cough medicine; in the early spring these needles may be chewed raw for the same purpose. The gum of spruce is chewed for pleasure by many people, although pregnant women do not chew it (or commercial chewing gum). It is thought that the neonate will stick to its mother's womb during delivery if the mother has chewed gum. Spruce gum was also used for caulking birch bark canoe seams.

Each year, a few days before Russian Christmas, a group of young men go out and cut a small spruce tree for each household. These trees are decorated with commercial bulbs and remain in the house until Russian New Year's Eve, at which time they are collected by the young men and burned in front of the village at midnight.

Along Norton Sound and to the interior the people are reported to use needles of white spruce for medicine, while the gum is chewed for pleasure or applied to wounds (Anderson, 1939, p. 716). In the treeless coastal and river habitats of the Alaskan Eskimo, driftwood is extremely important for building various structures, making utensils, and for firewood (Nelson, 1899). In areas where it is scarce, as on Nunivak Island, wood may be bartered for within the village (Lantis, 1946, p. 169), and in the tundra country adjacent to Baird Inlet families moving to a new location on the tundra often take with them every scrap of wood which can be used in building their new houses (Oswalt, field notes).

Coiled baskets of spruce roots are reported for the Bering Sea Eskimo (Nelson, 1899, p. 205) but were probably traded from the Ingalik Indians since such baskets are very rarely found in the Eskimo area but are commonly made by the Ingalik.

Poa sp., bluegrass; *puka yu'kak,* something you wipe with (the same word as is used for a modern face towel).

The seeded stem is the male part of the plant, and the leaves are the female part. The green leaves are gathered and used to dry one's hands. The leaves are sometimes collected, dried, and then split lengthwise with a small needle so that the threads may be used as the weft to bind mats. Dried leaves are also used for boot insoles or as winter bedding for dogs.

Informants at Napaskiak said that the fine matted roots of certain grasses (it was never ascertained precisely which grasses) were gathered from exposed river banks. These roots were washed, rubbed, and then used as diaper pads for infants and menstrual pads for women. On Nunivak Island old dry basket grass was used for menstrual pads (Lantis, 1946, p. 223).

It is generally believed by the people of Napaskiak that the height of the grass growing around the village in the summer indicates the depth of the snow the succeeding winter. The severity of the coming winter is predicted in this manner.

Populus sp., cottonwood (no specimen collected); *kohoni'lingot,* no translation recorded.

The wood of the cottonwood tree is sometimes used as fuel, but it is not gathered if spruce is available. There are also some utensils carved from cottonwood, such as dippers, spoons, and pestles, but again spruce is often preferred.

Sphagnum sp., sphagnum moss; *ohot'*, something to protect something.

Sphagnum is used for chinking log houses but has no other use.

On Nunivak Island sphagnum is used for diaper pads, and moss was also stuffed into the body openings of the dead (Lantis, 1946, pp. 223, 227); the latter is likewise reported for Little Diomede Island (Weyer, 1932, p. 258).

Urtica lyalli Wats., nettle; *katsli'nuk*, it burns.

Formerly large quantities of nettle stems were collected in the fall following the first frost. The stems were dried and their tough stringy inner stem was spit lengthwise. The fibers were twisted into two strand lines for the manufacture of ptarmigan snares and gill nets. No sex distinction is recognized in this plant.

Moss; *kuma'hotit*, something that makes it light.

This type of moss was formerly used as the wick for seal oil lamps. After it was collected, it was dried in the sun and then stored for future use.

The willow listed under another heading is also used in manufactures.

MEDICINES

The medicinal plants are prepared for use by cooking them in water after which the infusion is drunk or else a raw preparation is used as a poultice.

Nephroma arcticum (L.) Tross., arctic kidney lichen; *kus'koak*, no known translation.

These lichens are recognized as growing on or near decayed trees and are uncommon in the area. They were sometimes stored until winter and then boiled with crushed fish eggs as a food. The plant cooked alone in water was fed to a person in a weak condition to make him strong and is reputed to have been a very effective medicine.

Salix arbusculoides Ands., willow; *kono'holik*, sour tree.

The inner bark of this willow is considered to be a good poultice for sores. The shredded inner bark is placed on any type of sore overnight, and one application is expected to be an effective cure.

On Nunivak Island *Salix* leaves are chewed for a "sore mouth" and are placed in the corners of the eyes for watery eyes (Lantis, 1946, p. 202).

Recorded under the various headings are certain plants which also have medicinal uses. Such plants are tall cotton grass, wormwood, white spruce, false-camomile and sour dock. Sour dock, *Rumex* sp., is widely recognized as an effective astringent. Tobacco is used as a dog medicine.

CEREMONIAL USES

The umbel or umbel-like plants discussed below are the only plants at Napaskiak that were established as having had ceremonial significance.

Angelica lucida L., wild celery; *iki'tuk,* not pleasant to look at.

The young green stems of wild celery are collected in the spring. The strings are peeled away, and the stalk is eaten raw alone or after being dipped into a container of seal oil. The leaves were also collected while green and simmered in water for about an hour, after which they were mixed into a type of *agu'tuk* that contained greens, seal oil, mashed fish eggs, and a little sugar. The stalks are not eaten after July, when they begin to flower. Formerly the dried stems with the top of the plant intact were gathered both in the early winter and upon certain ceremonial occasions, the details of which were not recalled; the tops were set afire inside the houses and the burning stems shaken around inside and outside the house in order to purify the dwelling.

The Kodiak Island and Bristol Bay peoples gather the young wild celery stalks, and after peeling away the stringy outer layer, they eat the stems; they also cook the leaves with fish as a vegetable (Heller, 1953, p. 11). Lantis (1946, p. 178) records that the stalks were eaten raw on Nunivak Island.

Wild celery, apart from being a food, is one of the most important ceremonial plants used by the Kuskokwim River Eskimos. It was important in the purifying ritual described above for Napaskiak and was the focus of attention in an early winter ceremony described for Ohogamiut (Oswalt, field notes) on the middle Kuskokwim River. The essence of this previously unreported ritual is that two men are sent out to bring in bundles of wild celery. The plants reportedly call to the men and indicate that they want to be gathered. After large bundles are collected, the men return with them to the *kash'gee* (ceremonial sructure); the stalks are divided among the young men, each of whom puts a small bundle of the stalks above his sleeping place in the *kash'gee.* The plant roots are said to represent each man's partner from the underworld and appear to represent spirits of the dead. During four days of feasting the plants are fed at each meal; on the fifth day each young man dances with his bundle of stalks, and then adult men take the bundles and set them afire. They shake the blazing stalks over the dancer, and after they have burned out, each young man is given the remains of his bundle to take outside. On the ground he separates the individual stalks and makes them into the form of some animal.

On Nunivak Island the gathering of wild celery is part of the Bladder Feast; the plant is used in much of the ceremonial activity, which includes young men dancing with the stalks (Lantis, 1946, pp. 184-7). In his summary of the Bladder Feast, Weyer (1932, pp. 340-43) mentions wild parsnips being gathered, dried, and burned to purify the bladders and the man. This is no doubt the plant which I have termed wild celery, *Angelica lucida* L., since the Eskimo name for it is recorded as i-ki-tūk, which is nearly identical with *iki'tuk* at Napaskiak.

Ledum decumbens (Ait.) Lodd., Labrador tea; *ai'yut* no known translation.

Formerly, dried stalks were kept in the house; when a child was ill, a stalk was set afire, shaken around the head and shoulders of the child, and then thrown out the doorway. Some persons believe that when there are ghosts around outside a house a stalk should be lighted, shaken around inside and then thrown out the door. Some people drink Labrador tea mixed with their commercial tea since they enjoy the flavor of the blend.

Anderson (1939, p. 715) reports that this plant is used for tea along the northern coasts. People in Napaskiak mentioned that the Eskimos along the lower Yukon River at Russian Mission do not use it as tea, thinking that to do so would make them weak.

TOBACCO AND PERFUMES

All of the tobacco consumed by villagers is purchased from trader's supplies. It is smoked primarily as cigarettes and rarely as cigars or in a pipe. The leaf tobacco for chewing is mixed with various plant leaves or ashes to extend the tobacco or modify its flavor.

The perfumes are used to lessen an offensive odor or else to strengthen a scent that is enjoyed. The entire plant is usually used either dry or in a green state.

Nicotiana sp., tobacco; *chu'ya,* no known translation (probably from the English word chew).

Commercial leaf tobaccos are considered by some persons to be a good cure for a dog in a weakened condition. The ill dog is not fed for a day or two and is then given dried fish pre-soaked in a solution of strong brine water and a few handfuls of tobacco.

In the period immediately before historic contact, there appears to have been a well established trade of tobacco from Siberia to Alaska (Nelson, 1899, pp. 271-72), and it has been observed that Eskimos living along the northern rivers, such as the Kobuk River, made offerings of pinches of tobacco (Lantis, 1947, p. 45).

Petasites frigidum (L.) Fries., butterbur; *plugu'tuk,* no known translation.

In the spring after last year's butterburs are dry but before the

new growth begins, the plant may be collected, dried more fully, and burned to ashes. The ashes are then mixed into a quid of chewing tobacco. No sex is recognized in this species.

Salix sp., willow; *angvaslo'holik,* a tree that has too much of something.

The leaves of this willow may be dried and mixed with a quid of chewing tobacco if the birch fungus which is preferred is not available. Birch fungus; *kuma'hak,* no translation recorded.

Birch fungus is dried thoroughly and then reduced to ashes in a fire built outside. The fire is not built in the house due to the extremely strong odor of the burning fungus. The fungus ash is mixed with leaf tobacco or commercial chewing tobacco. Traders in the Napaskiak area buy this type of fungus from Eskimos who live along the middle course of the Kuskokwim River where it is quite plentiful. It is resold to the lower river people at the rate of from six to eight pounds for a dollar depending upon the dryness of the plant.

Nelson (1899, p. 271) describes birch fungus being reduced to ash and mixed into tobacco quids in the Bering Sea coast region.

Artemisia tilesii elatior T.&G., wormwood; *kanganu'hoak,* looks like a squirrel.

This plant is often picked in large bunches during its growing season; the juices are smeared over the hands to alleviate strong odors such as those resulting from handling fish head cheese. During the summer before men take steam baths, they collect a bundle of these plants and lash the stalks together at the base with a short length of string. During the bath this bundle is used as a switch with which to strike oneself, either because the stinging sensation is enjoyed or else to aid in the healing of a sprained or sore limb. The plant also may be gathered in the summer, dried thoroughly, shredded and applied as a poultice to a skin infection; after one application the infection will disappear. Formerly this plant was occasionally dried and pulverized to mix with a quid of chewing tobacco.

Artemisia sp. is reported as being used for poultices in northern coastal Alaska, and it is also taken for colds (Anderson, 1939, p. 716).

Viola biflora L., violet; *tiptugu'lik,* smells strong.

Women sometimes place a few stems and blossoms of the violet in the corner of the house or among their clothing to serve as perfume, but the plant has no other use. This practice was said to have prevailed before historic times.

The false-camomile is listed under the heading of foods but is also used as a perfume.

PLANTS NAMED BUT NOT USED

Achillea borealis Bong., yarrow; *punaiyulinu'kait,* bumblebee food.

Achillea sibirica Ledeb., Siberian yarrow; *anoktoulia'hak,* plant that has lots of wind.

Aconitum delphinifolium DC., monkshood; *stoak,* looks like a nail (*Stok* is finger or toe nail).

Some species of monkshood are poisonous in more temperate regions, but apparently the toxicity varies with the environment in which it grows (Muenscher, 1939, p. 77). The Eskimos at Napaskiak do not consider it to be poisonous. It was not used on Nunivak Island (Lantis 1946, pp. 172, 202) nor is it noted among the poisonous Alaskan plants listed by Heller (1953, p. 147).

Cladonia ?, reindeer moss; *tuntutnu'kaik,* reindeer food.

Deschampsia caepitosa (L.) Beauv., tufted hair grass; *chana'git,* no known translation.

Iris setosa Pall., arctic iris; *choikpu'goak,* like an iron knife (*choik'* is iron or knife).

The seed pod of this plant is called *gusugut'stuk,* like a rattle, since the seeds rattle in the seed pod.

The seeds of the arctic iris were used along north coastal Alaska as coffee after they had been roasted and ground (Anderson, 1939, p. 715).

Menyanthes trifoliata L., buckbean; *puingai'yulit,* grows with three.

Mertensia sp., bluebell; *punaiyulinu'kait,* bumblebee food.

Nuphar polysepalum Engelm., yellow pond lily; *papa'unuk,* no known translation.

Petasites frigidum (L.) Fries., butterbur; *mislko'howuk,* pretends to be a feather (also the word for cotton), or *punaiyulinu'kait,* bumblebee food.

Polemonium actiflorum Willd., polemonium, *akniginai'l:tuk,* keeps your finger from hurting, i.e., a thimble.

Potentilla palustris (L.) Scop., cinquefoil; *mih'chuk,* no known translation.

Rumex arcticus (?), dock; *kangagatutu'li,* no known translation.

Senecio congestus var. *palustris* (L.) Fern., groundsel; *kuviyuhpu'goak,* looks like a swan.

This plant is never used and it is thought to be poisonous. It was reported that some children once ate the roots and died shortly thereafter, and one informant was certain they had been killed by groundsel roots.

Heller (1953, p. 147) does not list this species among the poisonous Alaskan plants; however, Muenscher (1939, pp. 235-39) notes that sev-

eral of this genus contain a toxic alkaloid and have been responsible for the poisoning of domesticated animals in New Zealand, South Africa, and the southwestern United States.

Spiraea beauverdiana Schneild., spiraea, *chukchuk'goat,* no known translation.

Valeriana capitata Pall., valerian; *punaiyulinu'kait,* bumblebee food.

Informants consider this species to be a male plant and *Martensia* sp. to be the female plant of the same name.

PLANTS RECOGNIZED BUT HAVING NO SPECIFIC NAMES OR USES

Cardamine pratensis L., cuckooflower.
Galium boreale L., northern bedstraw.
Lathyrus palustris pilosus (Cham.) Hult., pea.
Pedicularis laboradorica Panzer., woodbetony.
Pinguicula villosa L., hairy butterwort.
Potentilla pacifica Howell, silverweed.
Stellaria media (L.) Cyril., common chickweed.
Thalictrum spars florum Turcz., medowdrue.
Trientalis europaea L., starflower.

CONCLUDING REMARKS

In the arctic and sub-arctic regions there is a great range of local adjustments within Eskimo culture. This is strikingly apparent in Alaska, where the Eskimos may be migratory caribou hunters, sedentary coastal whalers, sedentary salmon fishers, sporadically shifting seal hunters, or a combination of these and other types. With such environmental and related cultural diversity it is not surprising that plant utilization varies from one area to another. Only spruce is utilized consistently throughout Alaska. Actually, plants may have been used more extensively than has been reported; remarks such as Stefansson's (1921, pp. 63-4) that it never occurred to the Coronation Gulf Eskimos to eat crowberries even though they were abundant have come to be considered indicative of limited Eskimo plant utilization in general. There is also the fact that the arctic and sub-arctic habitats of the Eskimo are popularly considered to be "deserts", but this is largely untrue.

Considering Eskimo resourcefulness it is rather surprising that plants have not been more important in the economy. I would estimate that five to ten percent of the diet at Napaskiak consists of plant products, while Weyer (1932, p. 53) has estimated that not more than five percent of the Bering Strait Eskimo's is of plant origin. Among the Chugach Eskimo (Birket-Smith, 1953, pp. 42-4) plants are also quite important, and the various methods of preparation and preservation are more sophisticated than those of any other Eskimo group. This latter condition is probably due to Northwest Coast Indian borrowings

as well as to the relatively diverse plant resources of the area. Lantis comments that plant foods are a significant part of the Nunivak Island Eskimo's diet (Lantis, 1946, p. 173) but does not estimate the percentage of plants consumed in the total diet.

It is notable that few plants have acquired important positions in the ceremonial system. The most important ritual plants are wild celery, Labrador tea, and perhaps other umbel or umbel-like plants. It is recorded that on Nunivak Island plant roots are placed in a kayak to pacify a vicious walrus, grasses are used in purification, and there are mythological references to plant charms (Lantis, pp. 201, 286, 295, 314), but none of these nor any other plants seem highly important in Western Eskimo rites, with the possible exception of aconite whale poisoning among the Pacific Eskimos (Heizer, 1943). Thus, while plants may be significant in ceremonies, as foods, and in manufactures, only the latter usage is widely characteristic of the Alaskan Eskimo.

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Tucson, Arizona

AN ARCHAEOLOGICAL SURVEY OF THE SUSITNA VALLEY

William N. Irving

This is a report of work done in 1953 for the University of Alaska under contract with the National Park Service[1]. Investigation was to be made for sites in areas to be affected by a series of dams proposed for the Susitna River.

The Susitna drains an extensive area of the southern slopes of the Alaska Range and western slopes of the Talkeetna Mountains. Its lower course flows south-southwest and empties into Cook Inlet at a point some thirty-five miles west of Anchorage.

The 1953 survey was concentrated above the proposed site of the Devil's Canyon Dam in the region east of the Talkeetna Mountains. Included in the study area is the low-lying region of lakes Tyone, Susitna, and Louise. The lakes (approximate coordinates: 62°20′N; 146°30′ W) are situated in an intermontane basin which forms part of the Susitna-Copper River watershed.

Reconnaissance preceding the survey was undertaken by Dr. Ivar Skarland during June of 1953 and was carried on by air and on foot as dictated by the terrain. It was determined at this time that the lakes area would likely suffer greatest from inundation, hence the concentration of the initial survey here.

The survey was conducted during August and September 1953. In this time the writer examined the shores of Lake Susitna, most of Tyone Lake, and the Tyone River to the point where it is entered by Tyone Creek. The hills on the southwest side of Lake Louise were also examined.

The first week was spent in the company of Jimmy Second Chief, an elderly Indian resident of the area. Second Chief pointed out most of the sites found, as well as several that were not visited. His aid is most gratefully acknowledged.

PROCEDURES

Sites were numbered serially as encountered. In some cases, what appear to be several sites were grouped under one number. These were assigned a letter in addition to the number. As the material recovered by the survey has been catalogued using this system, it is retained here.

Numbers 3 and 6 should be considered *localities*, each comprising several sites. Sites thus recognized are 1, 2, 3A, 3B, 3C, 3D, 3E, 3G,

[1]This paper was originally written as a report for the National Park Service in the late summer of 1953. It was not then possible to give it the time necessary to prepare it for publication, and Frederic Hadleigh West has done me a great kindness in rewriting it entirely so that it could be published at this time. I have rewritten the final descriptive section on Early Pre-Contact Sites, and added the section Summary and Conclusions. The discussion of typology suffers from the fact that I have not seen the artifacts since 1953.

3H, 4, 5, 6A, 6B, 6C, 7, 8, 9, and 11. Number 8 could not be located; number 10 was not visited.

Following a brief description of the natural setting, the sites are arranged in a tentative chronological order.

GEOGRAPHICAL SETTING

The lakes country is strongly marked by the effects of relatively recent glaciation. Much of the topography in the vicinity of Lake Louise consists of steep, densely wooded ridges and knobs of till. Interspersed are numerous small ponds and creeks following erratic courses among drift remnants. Most of the remaining portion here is taken up by partly forested hills with long, low slopes, broad treeless marshes, meadows and many large ponds.

In general, spruce timber is thickest on dryer ground near the lakes and creek valleys. Between a third and a half of the area is treeless, and much of the remainder is but sparsely wooded, due no doubt, to local drainage conditions and recent fires. Poplar stands occur on many well-drained knobs, but these constitute a small fraction of the total area.

North and west of Lake Susitna the knobs and ridges of till are less numerous. Drainage patterns here assume a more normal appearance. Local topography is dominated by several large hills rising 500 to 1,000 feet above the lakes. Otherwise, the country is rather flat with few changes in elevation greater than 50 feet except at terraces of the Tyone River. Spruce forest occupies about three quarters of the area and there are large stretches of marsh. Dwarf birch appears in abundance in places too poorly drained to support poplar.

Low-lying vegetation is dominated by sphagnum except in the sedge meadows and marshes. Growing in or on the sphagnum, and apparently dependent on it for elevation above the standing water, are ledum, blueberries, and the lichens known as caribou moss.

Food resources available to aboriginals, in order of importance, are fish, especially whitefish, but also lake trout, ling cod, a type of herring, and grayling. In the way of large game, there are caribou moose, black and grizzly bears. Of the rest, muskrats, beaver, rabbits, ducks, geese, grouse, and ptarmigan probably were important. Such animals as porcupines and squirrels, although present, apparently did not figure importantly in the menu.

Generally most of the land-dwellers were taken individually, although, in the case of the caribou, the drive was used in several forms. Fish traps accounted for large quantities of whitefish from late summer until January. Salmon do not occur in this part of the Susitna system.

Blueberries and cranberries are abundant on hillsides and a number of edible roots and herbs are present.

Generally speaking, on a year-round basis, the country is not rich enough in these food resources to sustain large villages. On the

basis of recent houses discovered and information from local informants, it would appear that the early post-contact population was no more than one hundred persons. Presumably, these were living in scattered groups of five to thirty individuals following a semi-nomadic existence.

From Jimmy Second Chief, a willing and able informant, the following was learned. The annual cycle was divided into two major phases, dependent upon the feasibility of fishing. From midsummer through December, the principal activity was fishing. The group at this time would accordingly locate near spots suitable for using "V" and basket traps. Caribou and moose would be killed from time to time throughout the year, but were given particular attention in late summer and early fall. At this time bulls were fat and skins most suitable for clothing. Fish, however, formed the most important food item.

By midwinter, shallow places in the lake would freeze to the bottom and fishing would no longer be profitable. By this time, also, the meat stores from the previous fall would be exhausted. It was then necessary that extensive hunting of moose, bear, and beaver be carried out. It is not known whether this involved actual breaking up of the small community or whether it merely entailed groups of hunters fanning out over the countryside. Moose and caribou fences, in conjunction with snares and the surround, were used. This would continue until breakup, after which the hunters would go into the hill country often as far as the Talkeetna Mountains. Here they would remain hunting caribou until midsummer, when they returned for fishing. Travel was usually on foot; infrequently by canoe.

By tradition and geographical conditions, the people of the area are most closely associated with those of the Tazlina and Gulkana river systems. They appear to belong to the Atna (Ahtena) group, the residents of upper Copper River country. Second Chief refers to his people as "Tsathtane" (originally recorded as Tsaftane). A certain provincial feeling tends to segregate the more western members from those residing on the large streams of the Copper River drainage. Very likely this is accentuated, in the case of the lakes area peoples, by their marginal position and somewhat different ecological situation. Most notable in the latter regard is the importance of caribou and the complete absence of salmon.

Contacts with villages on the Tanana side of the Alaska Range evidently were of frequent occurrence in former times, but the nature of the relations was not learned. The people of the lower Tanana, the Yukon and Cook Inlet were more remote neighbors separated by great distances and dialectic differences. There is some indication that other upper Susitna tributaries were occupied by people closely allied to those of Tyone River and the lakes area. Cook Inlet people are referred to as "Tazna".

While communities of this area seem to have been relatively small, it appears likely that strong family ties served to foster intercommunal relationships, and it may be assumed that the residents of the three lakes and Tyone River formed a cohesive unit. Vestiges

of an elaborate system of trails may still be seen, and even now foot travel for distances of forty or fifty miles is routine.

The Tyone River people, then, are part of a cultural sub-group indigenous to the intermontane region, and think themselves different from the river people of the Copper and lower Susitna rivers. Whether the venture into this region of the Tsathtane is relatively recent or not, is not known. There is, in the archaeology here, however, a certain transient character which would tend to reenforce the idea of recency and lack of long-standing stability.

POST CONTACT SITES

3A. This site is located atop a fifty-foot knoll at the southern end of the spit separating lakes Susitna and Louise. The locality is known as *tus-kut-ka,* although the term applies particularly to the prominent hill on which 3A is located. The site consists of two log structures, obviously recent, and at least six house depressions which show no indication of white contact. The log structure component is considered under the post contact heading; precontact remains are described below. The larger of the log structures is about twenty feet square and was evidently a dwelling. The smaller, about ten feet square, probably represents a cache. It seems to have been raised on short posts. Evidence of the recency of the two structures consists in their notched log construction style and the discovery in the house of a small straight-sided copper pot, a large number of glass beads, and several bits of tin and iron. The house was roofed with birch bark held in place by rocks. The floor had been excavated to a depth of two feet. Other artifacts associated with these units are part of a spruce bowl, two boulder chips, and a whetstone of the type still used in the area.

6C. This and the nearby 6A and 6B are situated on the eastern shore of Lake Tyone at a point where it is barely one hundred yards wide. According to Second Chief, the locality is designated *min-gat-ka* ("between the lakes"). The home cabins of Second Chief and Johnny Tyone are here now. Formerly, this was a focal point of the now widely dispersed group to which they belong. There has been a log bridge across the narrows here for as long as Second Chief can remember. The remains of earlier bridges, generally of lighter construction may yet be seen. The designation 6C is given a dissected ridge lying about 250 yards back from the lake. On various knolls here are found evidences of relatively recent tent camps and two recent burials. The latter are in small hand-hewn plank boxes held together with a few square nails. Most are supported by stakes driven into the ground. On one was mounted a cross bearing two diagonal limbs below the horizontal one. This was put together without nails. Another burial was surrounded by a structure which had the appearance of two wall tent frames, one set inside the other. Nearby was a shovel of modern appearance. The grave box surmounted by the cross was examined, but it contained no skeletal material. Where the skull might have lain was a fairly large rock.

Sites 1 and 2. These two sites may be briefly noted. Both are

marked only by the occurrence of a few bones and other seemingly recent debris. On neither was there any indication of structural remains. Number 2 is located on the western shore of Lake Louise with Grayling Lake lying about a half mile farther west. Number 1 is on the southwest shore of Grayling Lake approximately three miles southeast of 2.

LATE PRE-CONTACT SITES

3A. 3A, 3B, and 3C are all centered about the short creek which connects lakes Susitna and Louise. The narrow creek is an ideal place to set weirs and fish traps. Moreover, ducks gather on the low shores nearby of the two lakes. The older, house depression component of 3A, consists of six rectangular depressions ranging from ten by twelve to twenty-four by thirty feet. Slight elevations bordering each depression are evidently the remains of spoil piles. Present depths of the depressions vary from a few inches to three feet, the latter figure occurring in the largest house. Adjoining, and centered on, one of the long walls of the largest house is a twelve-foot-square depression. This is presumed to represent a sweat bath. A straight entryway comes into the house at floor level at the opposite (southeast) wall. It is ten feet long and three feet wide.

Test pits within several depressions revealed floors generally lying three to eight inches below the surface. Fire-cracked rock, bones, charcoal, and boulder chips were found in the house fill. The largest house was built in a restricted pocket of sand, either natural or brought up from the lake shore. Near this house, a test pit disclosed a midden deposit which varied in depth from six inches to a foot. Recovered here was a boulder chip (retouched along one edge), pieces of flat grinding stone and a spatulate bone implement.

If the varying depths of the house depressions be accepted as a valid criterion, it seems unlikely that all six houses were occupied contemporaneously. Additional evidence for this assumption may be the vegetational differences to be observed between the various depressions.

3B. This site is located on a wooded knoll on the spit between the two lakes, near the shore of Lake Susitna. There are at least three large, indistinct depressions here. Investigation of one of these revealed the floor to lie about three inches below the surface. Fire-cracked rocks, bone, and charcoal fragments occurred in the fill. Artifactual material consisted of some sixty flint chips, three boulder chips, and one end scraper. As with the depressions at 3A, no evidence was found of white contact.

3C. A single house depression was found at this site. It is situated on a low hillock about 150 yards northeast of 3B. Part of a bifacially flaked side scraper was found here.

3D-3H. The first four sites are found on low eminences on the opposite (east) side of the creek from those discussed above. 3E and 3F consist of one house depression each. At 3D, one house yielded three boulder chips, a badly weathered antler implement, a flat, notched beach pebble, and a small rectangular hammerstone, used possibly

for cracking marrow bones. Indications at 3D are for a somewhat longer occupation than is assumed for the other small groups of this vicinity. The location in relation to the creek would seem especially favorable. 3H consists of two small pits on a point overlooking a small cove on Lake Susitna half a mile west of the creek. The cultural deposit is shallow and no artifacts were recovered.

There are doubtless other house groups in the area. Indications of occupation older than a few hundred years are lacking, but there remains the possibility that such will be discovered upon further investigation. Cultural materials are scant and only extensive excavation would yield collections of a size to be considered definitive.

6A. 6A is composed of three house pits situated on a low knoll about 150 yards northwest of the modern Indian cabins at *min-gat-ka* on Tyone Lake, mentioned above. One depression shows a present depth of two feet; the others, a few inches. Test excavation in one of the shallower depressions brought forth bone, burned rock, and charcoal. Also recovered were several boulder chips and one flint chip. Further investigation was precluded by the presence of sportsmen who set up camp on the site.

6B. A single rectangular house depression was the only feature found at this site. 6B is on a ridge about 200 yards north of 6A. The depression is small, six by eight feet, and about ten inches deep. Near one end of one of the long walls facing the river is a clearly discernible entrance passage about three feet long. In addition to refuse of the sort found in the fill of other houses, fish bones were abundant.

4. Site 4 is located on the east shore of a long peninsula which extends from the eastern side of Lake Susitna southward into that body. A single small depression, similar to those described above was discovered. Of chief interest at site 4 is an accumulation of caribou antlers lying next to the depression. This recalls similar traits found in northern Siberia, on St. Lawrence Island, and in the northern Plains.

5 and 7. Each of these two sites consists of a single house depression. Number 7 is supposed to have been the house of a very powerful chief and war leader. It is situated two thirds of the way up the south side of the hill called *su-sta-ki,* about two miles east of the point at which Lake Tyone narrows to become Tyone River. Number 5 is about five miles south on the western shore of Lake Tyone at a narrows. According to local tradition, these two sites were occupied contemporaneously. It is said that residents of one could see those of the other walking around on the hillsides.

The foregoing sites are all attributed to late Athabascan groups, some of which were probaby ancestral to the present Indian inhabitants of the area. Although they were not visited, it is assumed that sites number 2 and 10 belong in this late prehistoric-early historic period.

EARLY PRE-CONTACT SITES

Sites number 9 and 11 are characterized by artifacts that probably antedate the inferred Athabascan occupation by many centuries. They

may be added to the list of flint stations reported by Skarland and Giddings in 1948.

9. This site is on the top of a hill about two miles east of the Tyone River and seven miles northwest of site 6 at *min-gat-ka*. The hill, which rises an estimated 500 feet above the river, is not indicated on the U. S. Geological Survey Alaska Reconnaissance Topographic Map of Gulkana. North and a little east of it is a lake about two miles long and a mile wide, which drains into the Gulkana system. To the south is a small, well-developed creek valley which at present is traversed by a low divide between the Tyone and Gulkana river drainages. Nearby on the Tyone River are salt licks and a caribou crossing. That locality seems to be a concentration point for game of all sorts.

The hilltop affords an excellent outlook over the nearly flat surrounding country, about half of which is thinly forested or devoid of timber. A spot about 30 feet across on the higher of two knobs is largely bare of vegetation; on the exposed but little-eroded till were found 32 implements and an assortment of other cultural debris. Most of the material was found on the southern side of the knob, which suggests use of the site during the winter months when this section would be favored by the low sun.

Nothing about the provenience of the artifacts recovered was recognized as indicative of their age or associations. The specimens are classified here on the basis of their form and imputed use.

Projectile Points:

a) Stemless (Pl. II, no. 1) 2 specimens.
b) Expanding stem, convex base (Pl. II, nos. 3, 4) 2 specimens.
c) Side-notched, with concave or straight base, broad tip (Pl. II, nos. 5, 6) 3 specimens.
d) Lanceolate, with indistinct shoulders, contracting stem (Pl. II, no. 2) 1 specimen.
e) Point fragments too small to classify, 2 specimens.

Knives:

a) Side blades, diagonally flaked (Pl. II, nos. 7, 8, 12) 3 specimens.

Prismatic flakes:

a) (Pl. II, nos. 10, 11) 3 specimens, (1 doubtful).

Scrapers:

a) Side scrapers (Pl. I, nos. 4, 5) 7 specimens.
b) End scrapers (Pl. I, no. 3) 7 specimens.
c) Boulder chip scrapers (*tci-thos*) (Pl. I, no. 6) 3 specimens.

Core Tablet:

a) (Pl. I, No. 1) 1 doubtful specimen.

Miscellaneous:

a) Retouched flakes, 3 specimens.
b) Flakes.

c) Unidentifiable worked stone fragments, 3 specimens.
d) Bone and charcoal fragments.
e) Copper float, 1 specimen.

Total: 32 classifiable implements.

11. A single prismatic flake (Pl. II, no. 9) was the only implement found at site number 11, another lookout point about 11 miles south of site 9. For convenience it will be discussed in connection with the site 9 collection.

One of the stemless points (Pl. II, no. 1), made of light gray chert, has parallel sides and is ground on the basal edges. The other (not illustrated), of dark gray basalt-like material, has converging sides and a thinned, straight base which has not been ground. Both bear a general resemblance to points from Birch Lake and Station 4 at College (Skarland and Giddings, 1948, Pl. 15A, q; Pl. 15B, d), and the Campus Site (Rainey, 1939, fig. 7, no. 3). These points, whether or not they belong to a single type, are probably both pre-Athabascan, since neither form occurs at Dixthada (Rainey, 1939) or in late sites in the intermontane region.

Of the six points with stems or notches, no two are quite alike. The classification used here may, however, develop into a series of formal types when more material becomes available. One (Pl. II, no 3), of dark gray basalt-like material, has an expanding stem with a convex base, prominent shoulders or barbs, and notches smoothed by grinding. It measures 2 by 4 cm. Another, somewhat larger but broken (Pl. II, no. 4) has similar features including the ground notches, but lacks the prominent shoulders and has a broader stem. It is of light tan chert. Pl. II, no. 3 closely resembles one seen in the Campus Site collection, but not illustrated by Rainey (1939, 1940). It is also much like one figured by de Laguna from a late site at Halibut Cove on Cook Inlet (1934, Pl. 30, 170, 10).

Two points of chert, of which only the basal portions were found (Pl. II, no. 6) have shallow side notches and straight or slightly concave bases showing some evidence of intentional thinning. The notches of the one illustrated are ground. Both resemble a third, of quartzite (Pl. II, no. 5) which, however, has a markedly concave base and lacks grinding in the notches. The two fragmentary specimens are thought to have had broad, strongly convex tips like the complete one. The latter point is somewhat like two specimens taken from the muck near Fairbanks, illustrated by Rainey (1939, fig. 9, no. 4; fig. 11, no. 1).

The last point (Pl. II, no. 2) is roughly lanceolate in shape, with a poorly defined, converging stem and a straight base. It is relatively thick and crudely made of poor material, with no trace of basal grinding or thinning. Similar points are not hard to find in the literature of the western arctic and the northwest, but comparisons cannot be made without more detailed descriptions.

The remaining two point fragments are too small to be useful in typology.

Three fragments of diagonally flaked knives are of special interest, since the trait has not been reported before from central Alaska (Pl.

II, nos. 7, 8, 12). Pl. II, no. 7, made of a poor grade of chert, is relatively thick in cross section. Some of the flake scares are parallel and diagonal, and meet at a median ridge. Subsequent retouch along one edge indicates use as a cutting implement rather than as a point.

Pl. II, no. 8, a small fragment with converging sides, is much weathered. It is relatively thin in section, and shows well-controlled diagonal flaking from the edges to the median line.

Pl. II, no. 12, of light gray, translucent chert, has very fine diagonal flaking, and sharpening retouch along one edge. It is indistinguishable from side blade fragments characteristic of the Denbigh and related complexes — types hitherto known only from northern Alaska and western arctic Canada (Giddings, 1951; Irving, 1953; MacNeish, personal communication).

The seven end scrapers from site number 9 occur in a variety of forms. Two specimens are relatively narrow and thick, and are retouched only on the steep working edge. The illustrated scraper (Pl. II, no. 14) has a retouched notch on each lateral edge. Three others, represented by Pl. II, no. 15, are thicker and shorter relative to their length, and are retouched on all edges. Another specimen (Pl. I, no. 3) has a small notch on either side just back of the working edge. It may have some typological relationship to the notched scrapers of the eastern Archaic (Logan, 1952; Chapman, 1952). The last scraper is roughly triangular in outline, but has a markedly convex working edge (Pl. II, no. 13). It closely resembles some of the scrapers of the Denbigh Flint complex and the Campus Site (Nelson, 1935, fig. 15).

The artifact tentatively identified as a core tablet (Pl. I, no 1) resembles a type described by Hallam L. Movius (personal communication) and recognized by others who work with Upper Palaeolithic material. The present specimen is thought to have been removed from the striking platform of a conical or cylindrical blade core, to expose a new surface and thereby refurbish the platform. So far as is known, the type has been identified in Alaska only by the writer (Irving, 1954); it occurs but sporadically in other parts of North America (Irving, notes).

Three small prismatic flakes or microblades (Pl. II, nos. 10, 11) are each fragmentary, and lack intentional retouch. The specimen from site 11 (Pl. II, no. 9), although it is larger and made of different material, conforms to the same description. These implements are difficult to compare with specimens from other sites without a sample large enough for statistical treatment.

The remaining artifacts from site number 9 consist of 7 unifacially retouched side scrapers (e.g. Pl. I, 4, 5), 3 boulder chip scrapers (*tci-thos*, known locally as *men-daw-si*), 3 retouched flakes; chipping debris, unidentifiable worked stone fragments, a small flat piece of copper float, and bone and charcoal fragments.

SUMMARY AND CONCLUSIONS

Five of the 11 sites reported here (nos. 3 and 7) have remains of semi-subterranean houses. The number of house sites is actually greater

than this, for numbers 3 and 6 each comprise several separate components. Most of the houses are clearly rectangular. Where entrances are visible, they extend toward the river or the lake from the middle or one end of a long side. Sweat baths were noted at the rear of some of the larger houses at site 3A (but see below). The houses vary in size from about 6′ by 8′ to 24′ by 30′; the larger houses are generally located on higher hills than are the others. Rectangular storage pits were noted at most of these sites.

Settlements in most cases consist of from 1 to 3 dwellings. The larger structures may well have housed groups larger than the nuclear family. Brief occupation of most of the sites is indicated by the slight accumulation of midden in all but a few cases.

Further work in the locality should make it possible to interpret the pattern of settlement in terms of the ethnographic annual cycle and the social organization of the Tsathtane. The large houses on hills represent occupations different from those at sites clustered near fishing spots on small natural mounds; the latter, in turn, differ from sites such as numbers 1 and 2, where no evidence of structures was found. It may be possible to infer distinctions of rank and wealth, and occupations at different seasons, from the location and character of sites.

In general, the houses and the few artifacts recovered resemble those described by Rainey (1939) on tributaries of the upper Copper River, all of which he thinks are late. Some of the houses described here contain trade materials, and sites 3, 5, 7, and probably 10 (not visited, but described by Second Chief) are said by Second Chief to have been occupied by members of his band, presumably no more than three or four generations ago.[2]

The houses found on Cook Inlet by de Laguna (1934) and ascribed by her to the latest pre-historic period (Kachemak Bay III), when Indian influence was ascendant, conform closely in ground plan to the larger houses treated here. De Laguna notes that the small rooms in back of her houses were used for sleeping as well as bathing. It is curious that on Cook Inlet the territorial expansion of Athabaskans at the expense of Eskimos in late times is accompanied by an increase in the importance of ground slate implements, whereas in the present Athabaskan locality, well within trading range of the inlet, no trace of a ground slate industry has yet been found.

Sites 9 and 11 are of special interest, for although stratigraphic information is lacking, their implement types are evidence of wide-ranging cultural affiliations at a very early date.

One group of implements is probably related to recent Athabaskan occupations such as were described above. It includes boulder chip

[2]When Second Chief drew for me what he considered the aboriginal winter house, he indicated a shallow semi-subterranean dwelling with a central fireplace, possibly a sweat lodge at the back, but without an entrance passage. The superstructure he showed to consist of light poles bent to form a dome, over which was piled moss and dirt. It is difficult to tell from his drawing whether the dwelling was oval or rectangular with rounded corners.

scrapers, and probably some of the end scrapers. The stemmed point without basal grinding (Pl. II, no. 2) may also belong here, although it is considerably larger than most of those from Dixthada, and somewhat different from them in form.[3] The specimen may resemble more closely two points from the second period at Yukon Island (Cook Inlet), which suggests a somewhat greater age (de Laguna, 1934, Pl. 30, nos. 3, 7).

Of more certain antiquity are the three small diagonally flaked side blades, which are quite unlike any central Alaskan types. They are very similar in form and workmanship to side blades of the Denbigh Flint complex. This suggests a relatively early date, but the technological tradition represented by the Denbigh complex lasted for too long to permit even a rough cross dating on this basis. All that can be said is that workmanship of the style and excellence of Pl. II, no. 12 was discontinued well before the end of the first millenium B. C. at Cape Denbigh (Hopkins and Giddings, 1953). The specimens could be several thousand years older than this.

In any case, the fact of greatest significance is the occurence here of a type characteristic of, and so far as is known, peculiar to the country beyond the forest border. Elsewhere the writer (1955) has pointed out some of the differences between early industries of the boreal forest (e.g. the Campus site and Pointed Mountain, N.W.T.) and what he proposes now to call the "arctic small-tool tradition", represented at the Denbigh type site and sites in the Brooks Range (Giddings, 1951: Irving, 1953, 1954).[4] Here on the Tyone River is the only instance reported so far of a distinctive trait of the arctic small-tool tradition occuring in the province of the forest complexes. It is also the most southerly occurrence of this particular trait in western North America. One may hope that further work in this area will clarify the important relationship between the arctic and boreal forest traditions. The questions of which came first in Alaska, and when and where they diverged from their common predecessor are some of the most intriguing ones in arctic archaeology.

The last group comprises the seven remaining projectile points. These are not necessarily associated with one another; they simply belong neither to the arctic small-tool tradition nor to the recent Athabascan culture.

Especially worthy of note are the three points with shallow side

[3]The problem of deciding which of the Dixthada chipped stone types are recent Athabascan and which are earlier won't be dealt with here (c.f. Rainey, 1953). Both Rainey (1939) and the writer found that chipped implements are scarce in single component sites known with fair certainty to be Athabascan. Most of these, however, are fishing sites, unlike site 9.

[4]The arctic small-tool tradition has not yet been defined formally, although Giddings in 1954 and the writer in 1955 made preparatory essays in this direction. I would exclude from it, tentatively, the Anangula blade industry (Laughlin, 1954) and material from the Alaska Highway reported by Johnson in 1946, because they lack certain types of side blades and burins.

notches and straight or concave bases (Pl. II, nos. 5, 6). These and two similar specimens in the University of Alaska Museum look very much like a type from Natalkuz Lake in central British Columbia illustrated by Borden (1952, Pl. II, no. 15). The Natalkuz collection includes larger stemless points, oval bifaces, and prismatic flakes and cores. These traits also occur at the Campus Site and at Pointed Mountain; however, the points in question are not found at the latter sites. The Natalkuz specimens came from a large rectangular semi-subterranean house. A series of points from the Mortlach site in central Saskatchewan (Wettlaufer, 1955) also resembles the Alaskan examples (especially Wettlaufer's Pl. 5, no. 1). The long range comparisons are of questionable significance, since none of the specimens, including those from site 9, is described in sufficient detail. However, points of this rather specialized shape are so uncommon that their distribution in northwestern North America probably has historical significance. It is possible that in Alaska they represent a period between the time of the Campus Site and that of the late pre-historic houses. Photographs of specimens recently found in the Tangle Lakes district near the Alaska Range, sent to me by Ivar Skarland, illustrate points that may also belong in this category. With these specimens, it may be possible to set up a formally defined type with time and space limitations.

The two stemless points (Pl. II, no. 1) are too unspecialized to merit much discussion without a more adequate description. Points of this general form are found at the Campus Site, Natalkuz Lake, and in the Tangle Lakes collections.

The resemblance of the expanding-stemmed point with a convex base (Pl. II, no. 3) to a point from the Campus Site has already been noted. Pl. II, no. 4 may share this resemblance, but here the likeness is less clear. Points of this general description, but not always with ground notches, occur throughout a vast range of time in the United States (Fowler, 1956; Williams, 1957). They are unusual in Alaska, and may ultimately prove to be of diagnostic value. Another example, much like Pl. II, no. 3, is shown by de Laguna from a site on Cook Inlet (1934, Pl. 30, no. 10); provenience and data are uncertain.

The four prismatic flakes from sites 9 and 11 are of little diagnostic value. Without a sample large enough for statistical treatment (e.g. Irving, 1953) it is not worthwhile to hazard a guess as to whether they represent the arctic small-tool tradition or the forest tradition of the Campus Site and Dixthada.

As a general rule, archaeological collecions from the northern part of the boreal forest have been small and of "low characterization". It is clear from an examination of the material reported on here, however, that even without large collections and stratified sites it is possible to identify complexes and give them dates on the basis of comparative typology. Although much of the archaeology of the northern forest appears to be part of a nebulous continuum with poorly defined relationships to cultures of other areas, in some cases there are types and complexes of diagnostic value and limited distribution.

There are also instances of what appear to be sharp boundaries between regional cultures, such as that which apparently separates the slate-using province of southwestern Alaska and the province of the interior caribou hunters, and the boundary between the arctic small-tool tradition and the early complexes of the boreal forest, which may have followed the forest border. The significance of these distributional peculiarities for non-material aspects of culture is still an enigma.

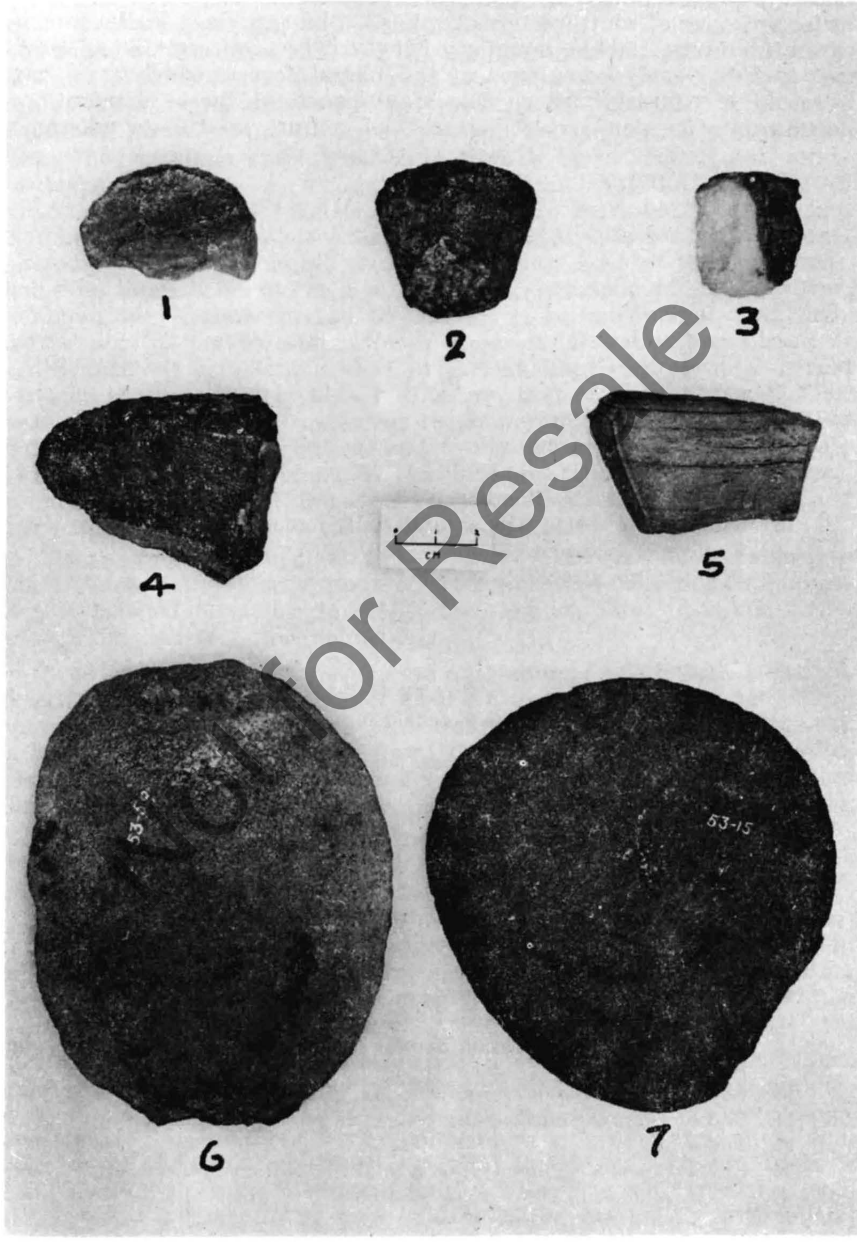
PLATE I

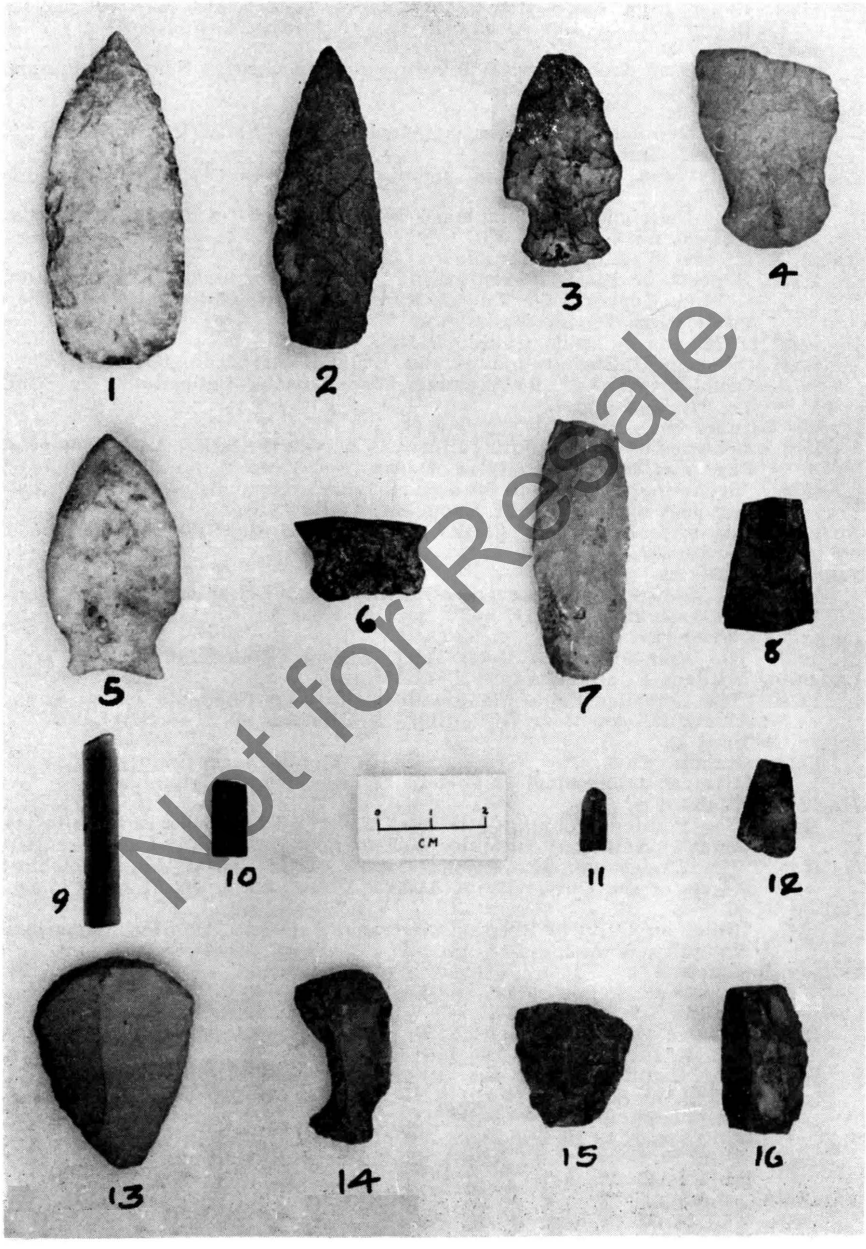
1. Core tablet (?) Site 9.
2. End scraper. Site 3B.
3. Side-notched end scraper. Site 9.
4. Convex side scraper, unifacially retouched. Site 9.
5. Straight-edged side scraper, unifacially retouched. Site 9.
6. Boulder chip scraper. Site 9.
7. Boulder chip scraper. Site 3B.

PLATE II

(all from site 9, except for number 9)

1. Stemless point, ground on basal edges.
2. Lanceolate stemmed point.
3. Stemmed, expanding based point, ground in notches.
4. Stemmed, expanding based point, ground in notches; fragmentary.
5. Side-notched, concave-based point; no basal grinding.
6. Side-notched, straight-based point; ground in notches.
7. Side blade; parallel flaking median ridge; thick section.
8. Side blade; parallel flaking to median ridge; thin section.
9. Prismatic flake; no retouch.
10. Prismatic flake; no retouch.
11. Prismatic flake; no retouch.
12. Side blade, parallel flaking; several scars from edge to edge; lenticular section.
13. End scraper, unifacially retouched on all edges.
14. End scraper, with unifacially retouched notches on both sides.
15. End scraper.
16. Side scraper; steep retouch on straight working edge.





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