COASTAL ECOLOGY AND WILD RESOURCE USE IN THE CENTRAL BERING SEA AREA: HOOPER BAY AND KWIGILLINGOK

by
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CHAPTER 1

INTRODUCTION

The following report is a descriptive account of the hunting, fishing, trapping and gathering of wild resources in two coastal communities of the Yukon-Kuskokwim Delta--Hooper Bay and Kwigillingok. A major objective was to document the use of wild resources by each community over an entire annual cycle and to examine the effect of ecological and environmental conditions on subsistence activities. Two Yup'ik coastal communities with different local environments were chosen to examine the differences that might exist in their harvest activities and provide a broader picture of resource use by communities along the central Bering Sea coast. The study took place from June 1981 to May 1983. The data shows that for both study communities fish, wildlife, and plant resources play important roles in the local economic systems. Variations in resource availability and harvest patterns between the communities in part result from differences in micro-environment and ecological conditions.

BACKGROUND AND RESOURCE ISSUES

This research stemmed from recent concerns expressed about impending resource developments and management decisions which potentially could affect the subsistence base of the villages of the region, especially those along the coast. In 1981 there was little baseline information on resource use in the coastal communities of the Central Bering Sea to assess possible impacts on subsistence uses. Some of the potential activities and issues confronting coastal villages include federal and state programs of oil exploration and development both on land and offshore; mineral leasing

and extraction activities; expansion of existing commercial fisheries and the development of new ones; and the admendment of the federal Marine Mammal Protection Act (P.L.92522) which permits state management of some marine species.

Federal oil leasing plans for several areas in the Bering Sea concerned local residents. The initial lease offerings for the Norton and St. George Basins took place in early 1983, while the Navarin and North Aleutian basins are scheduled for initial leasing in 1984 and 1985, respectively. By 1981 seismic testing for onshore oil in the Yukon Delta area had been conducted by an oil company in partnership with the regional Native corporation. The state offshore prospecting program was halted in 1975 (Brown 1983) as the result of a lawsuit, but the intent was to reopen the program and requests for resource information have been issued by the Alaska Department of Natural Resources for this purpose.

In addition to the minerals arena there are several continuing wildlife issues. The commercial salmon and herring fisheries in the study area are always subject to proposals for change. Since 1980 a commercial herring fishery at Cape Romanzof and a halibut fishery around Nelson Island have been opened. There have been proposals to open up the Nunivak Island area, and Nelson Island to commercial herring fishing. During the course of this research, the State of Alaska has been attempting to regain management of certain marine mammals. By September 1983, a request was forwarded to the Governor's office by the Department of Fish and Game for permission to enter the first phase of this process (Alaska Department of Fish and Game 1983). This was approved by the Governor. As of January 1984, however, the Department had not yet submitted its transfer application.

In light of these issues and developments, the Division of Subsistence was solicited by concerned agencies and individuals based in the Yukon- Kuskokwim Delta to gather baseline data about coastal communities. It was hoped that these data might aid in future impact assessment. It was the consensus of these agencies and individuals that the coastal communities were heavily dependent on local wild resources, especially those living in or using the marine environment. Little information existed on current patterns of resource use in this area.

RESEARCH DESIGN

The Division agreed to develop basic information on wild resource use by residents of a few communities of the central Bering Sea area. The project was intended to be broad and descriptive focusing on a wide range of resource activities in relation to local environmental, climatological, and habitat constraints. As much as possible, the intent was to develop data on a full seasonal round of resource activities in certain key communities and assess the role of local wild resources in the overall economic and social life of these communities. Rather than conduct a long-term study in one community along the coast despite broad regional similarities, the intent was to conduct research in several communities from different areas of the coast. It was expected that this approach would provide a fuller picture of the use of wild resources along the Yukon-Kuskokwim Delta coast, as each community might exhibit individual differences due to variations in the local habitat and resource availability. The coastal communities of the Yukon-Kuskokwim region are situated differently: some communities are situated near basaltic outcroppings; some are located in areas drained by a complex series of rivers;

others are in a coastal plain drained by short, shallow rivers and sloughs; while others are situated close to major river syatems such as the Yukon and the Kuskokwim with access to their fisheries. Given the range of variations possible in local habitat and associated resources a study in several communities was deemed preferable to a study in one.

An in-depth, longer-term project instead of a shorter-term survey appeared to be a more satisfactory methodology due to the broad nature of the research questions. In order to be present in the study communities during key periods of the annual round of resource harvest activities, more than one year was necessary to conduct research. The longer time span allowed the researcher to observe activities during different years, since observations during one year would not necesarily reflect usual conditions. Instead variations in resource activities could be noted. It was thought that each year would present its own climatological and environmental challenges and that a longer term study would be better to assess what adaptations, if any, local residents made in response to these challenges.

THE STUDY COMMUNITIES

The study communities of Kwigillingok and Hooper Bay were determined through the following process. First, the Bering Sea coast from Goodnews Bay to the Yukon River Delta was divided into six community groups based on community interrelationships and cultural similarities (Table 1). This was determined by consulting knowledgeable individuals from agencies in Bethel and literary references as well as by noting linguistic similarities and geographical proximity. Next, each community group was assessed for previous or ongoing research on resource harvest and use activities,

TABLE 1. VILLAGE GROUPS OF THE YUKON-KUSKOKWIM DELTA COAST

	Village Groups	Specific Research
1.	Stebbins St. Michaels Kotlik Emmonak Alakanuk Sheldon's Point	Wolfe 1979 (Kotlik) Wolfe 1981 (All Yukon Delta Villages except St. Michaels)
2.	Scammon Bay Hooper Bay Chevak	Fienup-Riordan 1983 (Scammon Bay, Sheldon Point, Alakanuk)
3.	Newtok Tununak Toksook Bay Nightmute Chefornak	Fienup-Riordan 1983 (Toksook Bay)
4.	Nunivak Island (Mekoryuk)	Lantis 1946 Nowak 1975, 1977
5	Kipnuk Kwigillingok Kongiganak Tuntutuliak	
6	Eek Quinhagak Goodnews Bay Platinum	

an existing data base, and the diversity in the local economic base in relation to general location and habitat features, and other socioeconomic characteristics. Finally, an "index" community was chosen for three of the community groups. It was recognized that the index communities were not identical with each of the communities in the particular group, but it was expected that they would exhibit basic similarities in resource use patterns to the others despite differences. Through this process the communities chosen for study were Kwigillingok (index village for Kipnuk, Kongiganak, Tuntutuliak and Kwigillingok group), Hooper Bay (index community for Chevak, Scammon Bay and Hooper Bay group) (Fig. 1) and Mekoryuk on Nunivak Island. Each community is in a distinctly different microenvironment. Together they illustrate some of the regional variation found in the coastal area of the Yukon-Kuskokwim Delta. Because of this, they do not represent the full range of patterns of local wild resource use.

After the index communities were selected by Division staff, the city councils in two communities and the traditional councils in all three communities were asked to hold a hearing on the proposed research during the spring and early summer of 1981. At each public meeting, the proposed study was explained to council members and other members of the public. Council input and approval were solicited. Each council considered the proposed research, gave their support, and offered useful suggestions and comments. The actual research began in summer 1981.

Following the first year of research, it was decided to postpone research in Mekoryuk in order to maximize the time available to be spent in Hooper Bay and Kwigillingok. Neither of the latter communities had ever been subject to long-term research conducted on their use of fish and

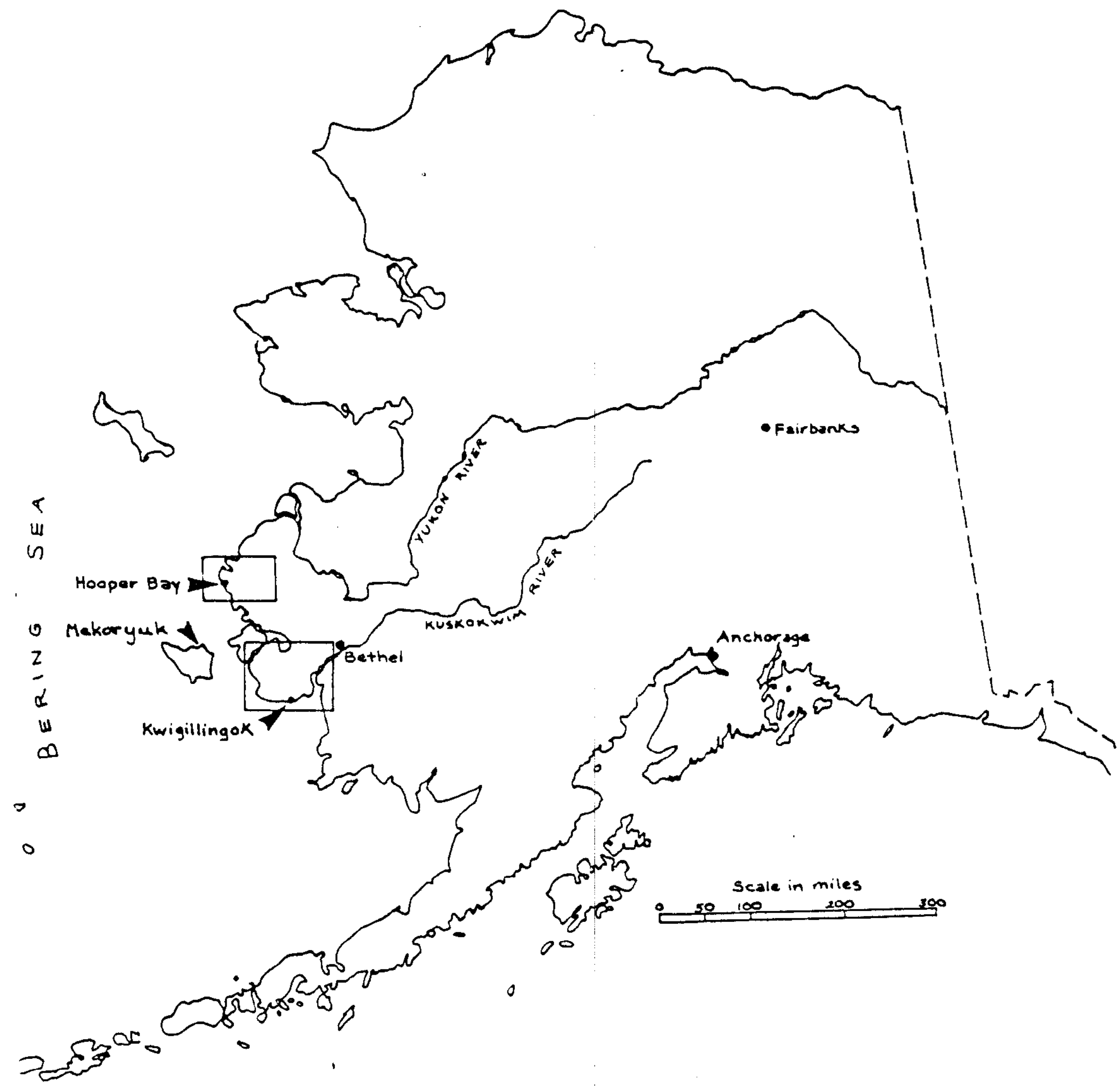


Fig. 1. Map of Alaska showing study communities.

wildlife resources. The Mekoryuk component of the project will be undertaken after the close of the Hooper Bay and Kwigillingok component.

Both Kwigillingok and Hooper Bay are Yup'ik communities located on the coast of Yukon-Kuskokwim Delta (Fig. 1). As noted earlier, they share broad regional similarities, while exhibiting differences due to their geographic locations.

Kwigillingok is a small community (about 205 people in 1981) located on the north shore of Kuskokwim Bay. The coastal plain where it is situated is generally low and flat. The myriad lakes and ponds in this area are drained by rivers and sloughs that are short and shallow. The coastline is bordered by extensive tidal flats and dotted by a few sandbar islands.

Hooper Bay is about 150 miles northwest of Kwigillingok and is located on Hooper Bay and one mile from the Bering Sea. It is the largest community in the Yukon-Kuskokwim Delta with over 640 people in 1981. The area around Hooper Bay ranges from marshy lowlands to basaltic outcroppings (the Askinuk Mountains) over 2,000 feet high. This section of the coast is host to abundant ponds and lakes as well as several large, complex river systems.

PREVIOUS RESEARCH

Recent research which had focused at least in part on the use of local wild resources in these two communities is extremely limited. In the mid-1970s, Calista, the regional Native corporation undertook a massive survey in all coastal communities detailing harvests and use areas of major resources. Most of these data have not been released to the public. In 1974 and again in 1976 Nunam Kitlutsisti, the environmental

arm of the regional Native non-profit corporation, conducted surveys in all communities of the Calista region. These surveys consisted of mail-out catch calendars. The data were presented as the number of pounds harvested by each village, each household, and by general resource category (fish, land animal, sea mammal, and vegetation). As no text or qualifications accompanied the quantitative information, the data are primarily used for supporting that subsistence uses play large roles in the Yukon-Kuskokwim Delta economy. In 1980, Ann Fienup-Riordan gathered general subsistence information on the Y-K Delta as part of her sociocultural baseline study for the Navarin Basin Environmental Impact Statement (Riordan 1982). However, since the project did not allow for much field work and primary research, the information gathered for most communities including Hooper Bay and Kwigillingok, is extremely limited. Her most recent work on harvest disruption was conducted in Scammon Bay, Sheldon Point and Alakanuk (Fienup-Riordan 1983). Most information on Hooper Bay and Kwigillingok subsistence derive from historic missionary sources, discussed in Chapter 3.

RESEARCH OBJECTIVES

The primary research object was to describe the use of wild resources within each community. The intent of the project was to document what resources were harvested by season, over a full yearly cycle of activities. For each resource, information was sought on who participated in the harvest activity, what gear and techniques were used, what areas were visited during harvest activities, how each resource was processed and preserved, and how products were distributed within the community after harvest. Other data sought included published biological information on

Yukon-Kuskokwim Delta as well as general environmental and climatalogical information for each community. The study also gathered information which primary harvesters had about local resources, environment, and climate in order to better depict harvest activities as they occur within a framework made up of many different environmental, climatological, and biological variables.

Additional objectives of the study were to develop general demographic data about the villages including community characteristics, population, wage employment opportunities, and other sources of income. General information on facilities, services, and administration in each village was also sought. The research included a review of the available literature for contemporary or historical references that would contribute additional information about the communities, harvest activities along the Yukon-Kuskokwim Delta coast, and other pertinent information. A final objective was to gather general information about local residents' concerns about their resources and possible impact by development and resource management activities noted above.

METHODOLOGY AND DATA COLLECTION METHODS

The research period was from June 1981 to May 1983 with field work conducted intermittently during this period. The principal researcher was the author. Two bilingual technicians assisted the project in 1981 and 1982 for a total of four months each. Paid translators were hired in the villages in conjunction with the mapping of resource use areas.

Population information was obtained by updating a 1980 city government census with the help of local health aides and other village residents. The census enabled more specific population data to be generated,

such as population pyramids and family size frequencies. Historical census data were also collected. A map was put together for each community in order to note the numbers and types of buildings present in each community. In Kwigillingok, the map was drawn from scratch. In Hooper Bay a map was obtained from the Alaska Department of Community and Regional Affairs and was further refined with assistance from the Hooper Bay city office.

Wage employment data were obtained from the community offices. Specific information on school employment was gathered from the Lower Yukon and Kuskokwim School districts. Additional information on wage employment was gathered from local residents. The U.S. Census of 1980 was consulted for income levels.

The gathering of resource use data required the most time and was the focus of field visits from Bethel, the work location of the principal investigator. Most field trips were 10 to 14 days in length, and scheduled to take place when important resource activities were occurring. Trips were arranged to coincide with the major activities of marine mammal hunting, herring fishing, salmon and tomcod fishing, fall berry and grass gathering, and winter whitefish and blackfish fishing. Whenever possible, the researcher or the technicians attempted to accompany village residents on resource harvesting trips. This enabled the researcher to observe first-hand many of the components which went into that resource activity such as participants, gear and techniques. Actual observation of the activity facilitated more detailed and pertinent questions to be asked about environmental and other conditions which affected that activity and generated information on the knowledge people had about resource and environmental constraints. If neither the researcher nor the techni-

cians were able to actually accompany local residents while they pursued resource activities, the activities were discussed with key residents during informal conversations. Since the timing of many activities was not precisely known the first year the scheduling of the trips during the first year did not always coincide with the peak period of many major activities. However, knowledge gained during the trips of the first year facilitated scheduling trips during the second year that more closely coincided with the peak or optimum period for observing major activities. Final trips were made to the communities after the initial analysis of data was completed to fill in any major gaps.

Information on resource use areas was collected through interviews with key respondents on specific resources or resource categories by season for each community. The councils of both communities were contacted and a meeting requested to explain the mapping component and to solicit approval. A meeting was held with the Hooper Bay City Council and with representatives of the Sea Lion Corporation. No meeting was held with the Kwigillingok Village Council, because of its time constraints; however, the project was discussed with the village council president and various elders on an individual basis.

The sample of community residents interviewed was comprised of persons who had been recommended as particularly active or knowledgeable about resource harvesting activities in 1982-83 and who were available to work on the maps. It was agreed that all persons interviewed were to be kept anonymous and paid for their time and that copies of the final mylar overlays would be made available for the communities own use. Data recorded on the maps included information on major resource activities pursued by the people interviewed (marine mammals, fish, birds, plants,

furbearers, among others), where these activities were pursued, and in which seasons. Most of the information gathered was on resource use areas that had been used within the past few years. Some additional information on past use areas was also gathered, but was not the major focus of the mapping effort.

In Hooper Bay, the people interviewed were primarily male elders who were still active in resource harvest activities and were recognized within the community for their knowledge about local resources and use areas. Eleven households were interviewed, representing nine percent of the total number of households present in the community in February 1983. Information was mapped onto mylar overlays on U.S. Geological Survey base maps of 1:63,360 scale. In Kwigillingok, the sample of informants interviewed were drawn from a broad age range, including elders from the community who were considered knowledgeable. Members of 7 households were interviewed, representing a 20 percent sample of the village households. Information from Kwigillingok residents were mapped on mylar overlay on U.S. Geological Survey base maps of 1:250,000.

The maps for both communities by necessity only represent a minimal depiction of resource use areas based on a sample of households. Most households gave information on areas they used for resource harvesting, but would indicate areas used in common by the whole community as well as other areas that were considered significant. After the initial compilation of information, a draft set of maps depicting areas of resource use were taken back to each community for review to make certain that the information was correct and as complete as possible for data based on a sample. After the draft overlays were approved, final mylar overlay versions were made as were smaller maps intended for inclusion in this

report. Geographic use information in this report is available on file with Division of Subsistence on the scale 1:250,000 for Kwigillingok and on a 1:63,360 scale for Hooper Bay. The work on this component took place at times between February and May 1983 and the report maps were completed during June 1983.

CHAPTER 2

NATURAL SETTING AND ECOLOGY

A primary objective of this report is the documentation of resource activities by Hooper Bay and Kwigillingok residents. Resource availability and biological patterns are largely determined by habitat and climate as well as other ecological considerations. The following chapter gives a brief description of the physical, climatological and other environmental characteristics of the Yukon-Kuskokwim Delta. The geographical setting of each study community is also given. A description of the local ecology and natural setting is intended to provide a context with which the communities and their resource harvesting activities may be examined.

REGIONAL PROFILE

The Yukon-Kuskokwim Delta is a massive estuarine system that stretches over 200 miles from Norton Sound in the north, to Kuskokwim Bay in the south, and extending inland about 200 miles. It consists of a triangular expanse of low marshy tundra set between the Yukon and Kuskokwim rivers. It is an area drained by innumerable smaller sloughs and rivers and dotted by ponds and lakes. It has been estimated that 40 to 50 percent of the total surface area of the Delta is made up of water (Wahrhaftig 1965). A tidal influence is felt on the Kuskokwim River at least as far inland as Bethel, some fifty miles from the mouth of the river, and varying degrees of tidal action are felt on all the sloughs and rivers that drain the coastal areas.

Climate

The Yukon-Kuskokwim Delta has been characterized as being part of a "transition" climatic zone (Selkregg 1974). Neither truly "continental" nor "maritime" in climate, its weather is highly variable and may resemble either during different times of the year. Summers are moderated by maritime influences and are often subject to extended periods of precipitation. During the winter, the presence of pack ice over much of the eastern Bering Sea reduces the marine influences and continental climatic patterns prevail. Usually, temperatures during any given year tend to be more extreme than those found in the maritime climatic zone proper, but are less extreme than continental temperatures. The amount of precipitation falling on the Delta fluctuates between the two climatic zones as does average wind velocity.

Climatological information from the meteorological station at the U.S. Air Force base at Cape Romanzof will be presented here as representative of coastal weather, although it should be noted that the coast of the Yukon-Kuskokwim Delta is itself so large and diverse that these figures may not be representative of all coastal locations. Based on 17 years of data taken at Cape Romanzof, average coastal temperatures range between 37 and 53 degrees Fahrenheit during summer and 6 and 24 degrees Fahrenheit during winter (Selkregg 1974). Extreme temperatures recorded for this area range from -25 to 79 degrees Fahrenheit (Selkregg 1974). These are more moderate than the extreme temperatures recorded at Bethel, where the minimum extreme temperature was -46 degrees Fahrenheit and the extreme high temperature was 86 degrees. The average annual temperature (31.7°F) is slightly cooler at Cape Romanzof than at Bethel (33.8°F); however the fluctuation between extremes is less (National

Oceanic and Atmospheric Administration 1982).

Average annual precipitation at Cape Romanzof is 20 inches, while in Bethel is 15 inches. Average annual snowfall is also higher at Cape Romanzof, (70 inches) in comparison with Bethel (40 to 50 inches) (Selkregg 1974; National Oceanic and Atmospheric Administration 1982).

Wind speed along the coast is slightly higher at Cape Romanzof than at Bethel, with velocities averaging 15.3 miles per hour from the northeast as compared to 12.9 miles per hour from the north-northeast at Bethel (Selkregg 1974; National Oceanic and Atmospheric Administration 1982). Both areas experience extreme winds of over 60 miles an hour. Winds are an especially important component of the Delta climate, especially in the winter when moderate to strong winds combine with cold temperatures creating chill factors far colder than the actual temperature. Winds affect sea conditions during the ice-free months and create conditions of blowing and drifting snow, as well as affecting ice movements in the winter.

Topography

As noted previously, the Yukon-Kuskokwim Delta is essentially a large, marshy, estuarine system. Its surface is generally low lying and flat, punctuated by innumerable ponds and lakes of different sizes and drained by numerous sluggish and meandering streams and rivers (Wahrhaftig 1965; Selkregg 1974). This low expanse is occasionally broken by small mountains of basaltic origin. These include the Nelson Island Mountains, the Askinuk Mountains north of Hooper Bay, Kusilvak Mountain east-northeast of Scammon Bay, and the Ingakslugwat Hills southeast of Hooper Bay (Selkregg 1974).

The land surface of the Delta is principally made up of unconsolidated solids, the coastal region consisting of deposits of both alluvial and marine sediments (Selkregg 1974). Soils are predominantly composed of loam and silt loam with a peat surface. Along the coast, stratified sands and silts also are found. In general, the soils of the Delta are poorly drained, being underlain by a shallow discontinuous permafrost table (Wahrhaftig 1965; Selkregg 1974). The permafrost of the Delta varies in thickness with a maximum known depth of 600 feet. Around large lakes permafrost may be absent.

Because of the poorly drained and unconsolidated nature of the local soils and presence of an extensive permafrost layer, the vegetation of the coastal areas of the Delta consists mainly of wet tundra plant communities. These are characterized by mosses, grasses, sedges and many plants capable of living in an estuarine marsh-type of environment, as well as many low mat-like perennials that do not put down deep roots. There are smaller areas where moist tundra and alpine tundra plant communities can be found. These communities are usually associated with land surfaces of higher elevation and occasionally better drainage than areas that host wet tundra plant communities (Selkregg 1974).

Ocean Currents and Sea Ice

Both ocean currents and sea ice influence marine resources and their availability. Currents affect migratory patterns of certain fish and marine mammal species and the direction of drifting objects such as driftwood and pollutants. Wind action and sea ice also alter surface currents. Prevailing surface ocean currents along the coast of the Yukon-Kuskokwim Delta during the summer usually flow close to the coast

in a north-northwesterly fashion at a mean speed of 0.1 to 0.3 knots per hour (Selkregg 1974). These currents are part of a larger system that flows along the north shore of the Alaska Peninsula and through Bristol Bay. During the winter, the prevailing current remains north-northwest, but shifts several miles off the coast and west of Nunivak Island. This westward shift probably reflects the presence of sea ice in the nearshore area (Selkregg 1974).

The presence of sea ice throughout most of the winter months has a major influence on coastal communities as well as others in the Yukon-Kuskokwim Delta. The general climate during the winter becomes more continental in nature as the moderating marine influence is pushed far to the west. Also the presence of extensive, solid ice (both shorefast and pack ice) may reduce accessibility to many local marine resources as well as causing other more mobile resources to migrate southward in advance of the encroaching ice. It should be noted that conditions of broken pack ice and limited shorefast ice permit certain marine mammals, especially seals, to remain within the general vicinity of the coast where these conditions are present.

During the summer, the ice pack is at its most limited distribution well within the Chuckchi and Beaufort seas. By October, ice begins to appear in Norton Sound as the ice pack starts advancing southward of Bering Strait. Usually by the first half of November, shorefast ice has begun to develop along the Yukon-Kuskokwim coast north of Kuskokwim Bay (Selkregg 1974). The shorefast ice continues to develop outward and by December is joined by pack ice of 50 to 70 percent coverage. The general southern boundary of sea ice during the winter is from northern Bristol Bay to the vicinity of the Pribilof Islands. North of this boundary or

leading edge, the Bering Sea has a minimum of 50 percent ice coverage during five months of the winter (Selkregg 1974). Ice coverage varies between locality and latitude. Shorefast ice in the Yukon-Kuskokwim Delta presents 100 percent coverage, while the pack ice offshore may be extremely broken with only 50 percent coverage. Ice coverage in any given year varies. During unusual winters, there is little or no shore-fast ice and a low density pack ice.

By March, the sea ice begins its gradual northward retreat and the shore-fast ice begins to gradually break up. This process reaches its peak in April and May with ice concentrations becoming as low as 25 percent. By June, the coast of the Yukon-Kuskokwim Delta is essentially ice free in most years (Selkregg 1974). This retreat again influences climatic patterns in the Yukon-Kuskokwim Delta and the availability and accessibility of various resources along the coast is influenced in part by the presence or absence of ice and the extent of coverage while present. While some resources are relatively inaccessible while the ice is present, others are most accessible under conditions of a highly fractured, retreating pack ice.

COMMUNITY SETTINGS

As noted in Chapter 1, Hooper Bay and Kwigillingok are coastal communities which share broad regional similarities, but also exhibit inherent diversity and subregional variation due to a variety of factors. Geographical location and differences in local habitat and other environmental features, in part, account for some of the diversity.

Hooper Bay, as previously mentioned, is a large community situated on the northwest shore of Hooper Bay and 150 miles northwest of Bethel

(Fig. 1). Prominent geographical features of this area include the bay on which the community is located and Kokechik Bay and the Askinuk Mountains about 15 miles north of the village. These mountains range over 2000 feet in height and stretch east from Cape Romanzof over 30 miles. The area around Hooper Bay is well drained by several rivers systems including the Kokechik, Kashunuk, Keoklivik, Aphrewn and Manokinak rivers described in later chapters, as well as many smaller rivers and sloughs. The land surface around Hooper Bay is variable in elevation, ranging from low-lying marshes bordering Hooper Bay and the south side of Kokechik Bay to the Askinuk mountains. Just north of the village is a large plateau that is over 5 miles wide in places and stretches over 30 miles east from the Bering Sea. It ranges in elevation from 25 feet to over 250 feet at Ingrisarak Mountain.

Hooper Bay is a large (11 miles wide), shallow tidal bay, bounded on each side by sand spits. Around Nuok Spit to the northeast, a series of sand dunes run northward to Panowat Spit paralleling the Bering Sea and bordering a sand beach. From Nuok Spit along the northwest shore of the bay are a series of small knolls. The settlement of Hooper Bay is situated on three of these knolls, bounded to the west by the Napayaraq River (Napayaraq Slough) and to the north by the Akulakutuk Slough. The oldest and most densely settled part of town is on a knoll at least 30 feet high on the west bank of the Napayaraq River. South of this knoll is "Tomaganuk's Hill," which is slightly lower in elevation and size and the least densely settled part of the community. West of these is the newest part of town, called the "housing" section built within the past two decades on a knoll about 25 feet in height. A two-mile long gravel road leads from the main knoll west through the housing section to the airstrip

which runs roughly north-south alongside the beach. A network of boardwalks runs through the main knoll and the housing section. The settlement generally is not prone to flooding during the ice-free months. However, winter floods and storm surges that resulted in the movement of ice inland have occurred within the lifespan of some of the oldest village residents. Some subsidence has taken place at Hooper Bay.

Kwigillingok is located 80 miles southwest of Bethel on the north shore of Kuskokwim Bay and over 20 miles west of the mouth of the Kuskokwim River (Fig. 1). There are no prominent geological features in this area and no major geographical features such as bays, other than Kuskokwim Bay itself which is over 100 miles wide. The coastline in this area is relatively straight and bounded to the south by extensive tidal flats and punctuated by sandbar islands near Cape Avinof to the northwest. The land surface is relatively uniform in elevation rarely exceeding 30 feet above sea level. The land is dotted by lakes and ponds and most of the rivers and sloughs draining this section of the coast are short in length and extremely shallow.

The village is located less than a mile from the coast on the west bank of the Kwigillingok River. Houses are built to take advantage of proximity to the river or local sloughs, and periodic "high ground" sites. This has resulted in the village being spread out about a mile along the river in a few dense clusters of houses. A network of boardwalks runs the length of the village linking the houses. The only road is about one-half a mile in length and leads from the village to the gravel airstrip. Because of the low relief of the land, subsidence is common as is periodic flooding and dangerous ice movements, conditions noted by Nelson during his sled journey in 1878 (Nelson 1882). In the mid-1960s

many seal camp locations near Kwigillingok were abandoned, because of subsidence which caused them to be under water or ice. This subsidence and severe fall flooding precipitated a move on the part of some village residents to a knoll about 9 miles northeast of Kwigillingok in the 1960s, where the community of Kongiganak has been established. Other village residents moved their houses back further back from the coast.

Because of its proximity to the Kuskokwim River, weather and climatic patterns at Kwigillingok fluctuate between those of Hooper Bay (as represented by Cape Romanzof data) and Bethel. Annual precipitation is similar to that of Hooper Bay; however annual snowfall is similar to that of Bethel. Ice conditions at Kwigillingok vary somewhat from Hooper Bay because of its more southerly location, differences in its geographical features, and possibly influences of the Kuskokwim River itself. The shorefast ice around Kwigillingok tends to be more stable when present with less flaw zones due to the absence of natural fracturing agents (Cape Romanzof is an example). The more southerly location usually results in less extensive coverage of the pack ice and a slightly earlier break-up with accompanying deterioration of the shorefast and land based ice (Selkregg 1974).

Both communities are situated in micro-environments that are products not only of broad regional climatic patterns, topography, and marine components, but also in local features of geography, elevation, and geology. These micro-environmental differences influence subtle differences in resources and harvest patterns, as will be discussed in subsequent chapters.

CHAPTER 3

HISTORICAL BACKGROUND AND CONTEMPORARY SETTLEMENT PATTERNS

HISTORICAL OVERVIEW OF THE STUDY AREA

Russian activity in the eastern Bering Sea began by the early 1700s, but most explorations were confined to the Aleutian Islands and the Bering Strait region (Ray 1975). Probably the earliest explorer to get near the Bering Sea coast of the Yukon-Kuskokwim Delta was Captain James Cook in 1778 (Oswalt 1980). It is likely that Captain Cook made it into Kuskokwim Bay, but encountering shallow water and shoals, he turned back to sea heading northward and failed to see either the Yukon or Kuskokwim rivers (Ray 1975). In the 1790s a party of traders led by Vasily Ivanov made their way to the middle Kuskokwim River by way of the Nushagak and Holitna rivers but this party crossed the portage to the Yukon and did not explore the lower stretches of the Kuskokwim River or the Bering Sea coast.

By the second decade of the 1800s the Russian-American Company was beginning to turn its interest north of the Alaska Peninsula and Aleutian Islands. In 1818 Peter Korsakovskii led the first northward expedition of the Company with orders to establish a redoubt or fort in the Bristol Bay area (Oswalt 1963). Korsakovskii left some men to build a redoubt on the Nushagak River, while he explored the area further north probably entering the lower Kuskokwim River before turning back to the Nushagak (Oswalt 1963). During the same year, Eremy Rodionov set off from Lake Clark, descending the Holitna River to the Kuskokwim. He followed the Kuskokwim river downstream for a while before turning back toward the

mountains and crossing over to the Mulchatna River where he met Korsakovskii (Oswalt 1980). Aleksandrovski Redoubt on the Nushagak River was established by 1819 and some information about the still mysterious region of the Kuskokwim River and coast was given by Eskimos traveling to the Redoubt.

Meanwhile, the Russian-American Company was sponsoring further exploration of the Bering Sea coast. In 1821 five ships were sent northward, but only three voyages had ramifications for the Yukon-Kuskokwim Delta coast. On the fourth of July, Gleb S. Shishmarev reached Cape Romanzof north of present-day Hooper Bay. Adolph Etolin, who also passed the Cape on August 11 in the same year, named it Cape Romanzof (Ray 1975). Etolin managed to enter the lower Kuskokwim River and trade with some of the Natives, but did not get any information on the total size of the river (Oswalt 1963). On the July 11 Mikhail N. Vasiliev landed at Nunivak Island which would become a common "supply stop" on journeys between the Aleutians and the Norton Sound and Bering Strait areas (Ray 1975). After these voyages, however, the remainder of the coast between the Kuskokwim and the Yukon rivers was largely unexplored until the late 1800s. Then again, the focus of exploration in the Yukon-Kuskokwim region centered along the rivers themselves, specifically the middle and upper portions of the river.

The first sustained contacts by outsiders with Bering Sea coastal communities between the mouths of the Yukon-Kuskokwim rivers was probably through the trading station along these rivers. In 1832, Kolmakov established a trading base near the junction of the Holitna and Kuskokwim rivers, a base moved downstream to "Kwigiumpainukamiut" the following year when it was determined that this would be a better location for

trade (Michael 1967; Oswalt 1980). This trading post principally had an impact on the middle Kuskokwim and lower Yukon rivers as this site was still hundreds of miles from the coast of Kuskokwim Bay. Fort St. Michael on St. Michael Island north of the mouth of the Yukon River was established in 1833, fostering trade and exploration in the Norton Sound and Yukon regions as well as the middle Kuskokwim.

In 1841, Semen Lukin constructed Kolmakovsky Redoubt across the Kuskokwim river from the second and earlier trading station. The Redoubt was to remain a year-round post until 1866 (Oswalt 1980). In 1843, the Russian Orthodox priest Ilia Petelin visited the Redoubt and baptized the local people, apparently being the first priest to visit the Kuskokwim (Michael 1967).

Historic data documented the first trade of arctic fox pelts at Kolakovsky Redoubt in 1853. Because these animals remain restricted to the coastal fringe and are most common in the coastal areas north of the Kuskokwim, there is some indication that the fur trade was extending out to the coastal villages by this time. Oswalt (1963) speculates that the trade in these particular pelts may indicate that the Russian post called "Mumtrekhlagamiut station" (near present-day Bethel) was established around this time.

In addition to contact by fur traders, the Russians introduced infectious diseases to the Delta. During 1838 and 1839, the first of many introduced disease epidemics swept through much of Alaska. This smallpox epidemic probably struck most of the villages of the Yukon-Kuskokwim Delta as well but because there were very few European observers in this area, the true extent of the casualities may never be known (Oswalt 1980).

Russia sold its holdings in Alaska to the United States in 1867. In the year prior to this, Kolmakovsky Redoubt was abandoned, probably in anticipation of the sale (Oswalt 1980). Hutchinson, Kohl and Company in San Francisco bought the assets of the Russian-American Company. This company later reorganized to become the Alaska Commercial Company (Oswalt 1963). The sale of Alaska resulted in the removal of the Russian-American company's monopoly on the furtrade. An increased number of fur traders entered the region resulting in higher prices, an increased diversity of trade goods, and a period of rapidly shifting technology in areas with access to trading stations (Wolfe 1979).

During the winter of 1878 to 1879, E.W. Nelson made a two-month long sled journey from St. Michael's to the coast near Cape Romanzof and then south to the Kuskokwim River before taking an inland route back to the Yukon River. He was the first explorer to travel the entire coastline of the study area. At this time there was a fur trader stationed on Nelson Island and other fur traders had apparently made short trips along the coast (Nelson 1882). He mapped the coast for the first time, although there are several inaccuracies due to the fact that he was unable to take along any instruments other than a compass.

Besides seeking to gather geographic information about the coast and other areas of this poorly documented region, Nelson collected ethnographic information and material items produced by the local inhabitants. Of particular interest to this project are his population estimates of the early settlements in the study area. The village he called "Askinuk" was located at the present day site of Hooper Bay and was occupied by nearly 200 people (Nelson 1882). He noted that these people were among the most hospitable that he encountered on his journey and produced fine

ivory carvings and other items of excellent workmanship. He estimated between 100 and 200 people at "Kushunuk" which was the previous residence of many people who now reside in Hooper Bay.

Nelson traveled the coastal plain where the villages of Kwigillingok, Kongiganak, and Kipnuk are currently situated. He visited "Chalitmiut" near present-day Kipnuk. This village he estimated as having 60 residents. He traveled through "Anogogmiut" west of present-day Kwigillingok, but no population estimates were given. He estimated a population of 175 at "Kongiganagmiut," the same location as present-day Kongiganak. He noted that this was "one of the places which has seen but one or two white men since the occupancy of the country by the Russians" (Nelson 1882:669). He found this section of the coast very low and encountered large areas of tundra that were covered with a heavy layer of sea ice. He stated that it was not uncommon for villages in this area to be razed by ice brought in by storm surges. He also noted that people along the coast from "Kushunuk" to "Kongiganagamiut" commonly took walrus and were expert at ivory carving. He summarized his findings by noting that the people between the lower Yukon and Kuskokwim rivers were "among the most primitive people found in Alaska, and retain their ancient customs, and their character is but slightly modified by contact with whites" (Nelson 1882: 670).

Contact with the people of this section of the Bering Sea coast was to increase markedly in the decades following Nelson's journey, although travelers to this region were still limited in numbers. In 1880 the Revenue Cutter Corwin captained by C.L. Hooper sighted Cape Romanzof on its journey northward, but it was not until the following year that the ship would make it to the bay that was to bear his name -- Hooper Bay (Nelson 1882).

Missionaries and priests arrived in the area in the 1880s. The federal agent for Alaska, Sheldon Jackson, encouraged several denominations to send missionaries to the region. One of the churches that responded was the Moravian Church based in Pennsylvania (Oswalt 1963). By 1885 they had established a mission at the Alaska Commercial Company's "Mumtrekhlagamiut" station. They named their site Bethel and from this location they ministered to both upriver and downriver villages.

Except for a few census trips and short winter sled journeys, the missionaries had very little contact with coastal villages north of the Kuskowkim River until Ferdinand Drebert established a mission site at "Quigillingok" (Kwigillingok) in 1915, a village he had first visited in 1912. There he encountered people whose basic way of life had altered very little and whose seasonal travels away from the village made the establishment of a school during winter difficult (Drebert 1959).

In 1889, around the same time the Moravians were establishing the mission at Bethel, Jesuit priests of the Catholic Church established a mission at Tununak on Nelson Island in 1889. However, they found this outpost too remote and by 1893 they had relocated to Akulurak on the Yukon, leaving no year-round Catholic missions on the Central Bering Sea coast until the 1920s.

In 1900, two separate epidemics of measles and influenza swept the Delta. The mortality due to these epidemics and related afflictions ranged from 12.9 percent in villages with resident non-Natives able to provide medical care to 74.4 percent in villages far from such care (Wolfe 1982). These epidemics and the resultant mortality caused the abandonment of many villages and camps and the consolidation of others. Some authors have asserted that these epidemics removed many of the

oldest people in the population who were most resistant to cultural change directed by the missions (Riordan 1983).

In the first quarter of the twentieth century there were other events which would have wide-ranging implications for all the villages of the Delta. A reindeer herd was procured by the Bethel mission in 1901, the beginning of a reindeer experiment that would last until the 1940s. Small herds were located in various places around the Delta, including Hooper Bay, ostensibly to provide a new source of food for the Eskimos and to train them to be herders.

Another major event that would increase the rate and type of trade and commerce taking place along the Kuskokwim River was the discovery of a channel up the river in 1908 and the first docking at Bethel of a deep draft oceangoing vessel in 1915 (Oswalt 1963). This discovery eliminated the previous practice of supply ships docking at the mouth of the river and the cargo being lightered upriver on smaller vessels. The discovery also helped establish Bethel as the center of commerce for the delta (Oswalt 1963).

Probably the establishment of schools had a more direct effect on the way of life of the residents of Kwigillingok and Hooper Bay. Hooper Bay's first school opened in 1911 and was administered by the U.S. Bureau of Education (A. Shinkwin pers. comm. 1983). A school was established in Kwigillingok in 1915, operated with variable levls of attendance by Rev. Drebert in the Moravian mission house (Drebert 1959). A government teacher assumed the education of Kwigillingok children from 1928 to 1929. In 1932, the Bureau of Indian Affairs took over the administration of all village schools, providing continuous secular schooling for Kwigillingok and Hooper Bay (Bureau of Indian Affairs Records 1945; A. Shinkwin pers.

comm. 1983). Schools had many impacts on communities. Besides providing children with an introduction to the Euroamerican educational system attendance at schools caused familes to travel away from the village less often, especially the fall and winter. The schools encouraged other families to move in from more isolated family settlements, consolidating village sites and creating more permanent year-round settlements. This altered some parts of the seasonal round. These changes did not occur rapidly but took place gradually over time.

The Catholic church established a year-round mission at Hooper Bay in 1928 which ministered to the Central Bering Sea coast until missions on Nelson Island were re-established in Nightmute in 1931 and Tununak in 1934 (Menager 1962; Riordan 1983). The missionary influence over the coastal village populations was wide-ranging, although changes took place over time and those villages with constant contact changed more rapidly than did those which only had intermittent contact. Both Moravian and Catholic churches tried to change the local family structure into one more consistent with Euroamerican ideals. Their effect on the ritual life of the people differed, however. The Moravians sought to stop the traditional forms of winter ceremonies which were important for both intra-village and inter-village relations. The Moravians opposed the traditional gatherings because they felt these led to all kinds of excesses (Oswalt 1963). In their place they substituted song fests and church rallies (Oswalt 1963) which continued to still allow people from different villages to get together in the winter. The Moravians also worked to develop a written Yup'ik language, and most of the missionaries endeavored to learn the language so that they could conduct services in it and perhaps effect the local people's conversion more rapidly (Oswalt

1963).

The Catholics, on the other hand, did not oppose all annual ceremonies in the villages they ministered to, although they did try to eradicate the ones they thought led to excesses or to fostering of the older religious beliefs. The dances considered secular they permitted to continue (Menager 1962; Riordan 1983). The Catholics were more ambivalent about retention of the local language. Some priests felt the Church would have more response if conducted in Yup'ik, while other priests thought that the sooner the Natives could speak English, the sooner the church would be effective (Riordan 1983).

The presence and strength of Euroamerican institutions in the first quarter of 20th century were still not sufficient to offset natural disasters which had long been a part, albeit irregularly, of Yup'ik life. In 1918 a period of starvation occurred during late winter and early spring along the coast, and Euroamerican observers in Kwigillingok and Hooper Bay documented the results. The winter had preceded normally with intervillage feasting taking place, except in the case of Kwigillingok's feast and dance during which the guests from other villages were forced to remain in Kwigillingok for several days after the close of the ceremony due to bad storms preventing their return. During this time residents continued to feed their guests from their finite food supply. Winter food stores were depleted in both villages before the end of winter and people were awaiting the return of the seals. Unfortunately, during the spring the seals failed to appear in adequate numbers and people were forced to eat items such as boot soles, qayaq covers, dogs, and other non-normal "food-stuffs" (Sullivan 1918). Both the missionary in Kwigillingok and the teachers in Hooper Bay attempted to provide some food

during this period, but their own food supplies were meager. They could not prevent the deaths of the more vulnerable members of the communities (Sullivan 1918; Drebert 1956). This starvation occurred well within the lives of the elders still living in the communities and, as a result of the experience, they are respectful of the vagaries of nature. It would not be until the establishment of stores and more reliable winter transportation before the fear of winter starvation would become a thing of the past.

The year following the 1918 starvation saw the last of the major epidemics to sweep Alaska. During this influenza epidemic, Hooper Bay lost 12 percent of its population, primarily among the elderly and chronically ill people (Sullivan 1917). The epidemic did not spread south of Nelson Island, so Kwigillingok was spared (Theile 1919; Call 1919).

HISTORIC SUBSISTENCE PATTERNS

Historic subsistence patterns discussed in the following section were reconstructed from early documented ethnographic accounts. Prior to sustained contact with Euroamericans, the aboriginal patterns of subsistence for the coastal areas near the present sites of Hooper Bay and Kwigillingok were characterized by annual movements between semi-permanent winter settlements and seasonal spring, summer and fall settlements or camps. Some of these winter settlements were large with one or more qasgiq (men's community house) and numerous surrounding sod houses (Nelson 1882). Alternately they might be the settlements of just one or two extended families (Drebert 1956; Menager 1962). Although much of the ritual and inter-group social life of the local people took place during the winter, with individual members or families coming and going as

subsistence needs required. Today, elders from Hooper Bay recount walking up to the mountains as far as Scammon Bay in order to harvest winter fish to take back to their families. They might be gone for a week or more at a time. Other elders noted that during winters of very little food, more than one family might relocate to the Kokechik Bay in order to harvest needlefish for food.

Prior to break-up, the settlement often dispersed, as family groups headed to seal camps nearer the open water. In some cases, only the men went but the women would take food to the people at the camps and brought back seals which were harvested (Drebert 1956).

Most of the activities which took place from break-up to freeze-up were done by individual family groups, although it was possible for more than one family to do things together (Riordan 1983). Seal meat was cut and dried and the blubber put into seal "pokes" (sealskins left intact without holes and the skin turned inside out) to render. Seals were harvested by men using qayaq and spears. For large marine mammals, such as walrus, bearded seal, and belukha, float boards and inflated sealskin floats were used to slow the wounded animals in their escape (Nelson 1979). After break-up, men started hunting waterfowl with spears, arrows and snares and fished along the coast (Nelson 1979). The harvest of herring and Bering cisco with seine nets was a cooperative effort of a few men (Nelson 1899). Fish, such as salmon, sculpin and bottomfish species were harvested with a sinew net set in shallow bays and checked using a qayaq (Nelson 1899; Menager 1962).

The little historical information about the roles of women, indicates that they were involved with processing the harvests of the men as well as accounting for the majority of gathered products, such as edible

plants, eggs, and berries. To harvest any specific resources, the people moved to advantageous locations. Thus, they traveled to one location for seal hunting in spring, to another for salmon fishing in summer and to yet another for berry gathering in fall. Although most of these activities could be pursued by individual family groups, others required the cooperative effort of a few groups. These included seining fish, driving geese during the molt, and driving belukha whales (Nelson 1899; Wolfe 1979). Caribou were present during aboriginal times along the coast and probably required cooperative hunting as well.

The winter settlement was situated where people had access to winter resources such as fish and furbearers. If families had not been successful during the spring through fall, they would depend on these resources to carry them through the winter. For those families "wealthy" enough to maintain dogteams, winter fish species especially blackfish, provided the bulk of dogfood.

The winter marked the peak of ritual and inter-group social life for the coastal residents. There would be dances and feasts held that were important for local solidarity as well as feasts which involved surrounding villages, strengthening regional ties and leading to the exchange and trade of goods. Not only did these rituals reinforce social solidarity, but some were to show respect to the harvested animals in order to ensure continuity of future harvests (Nelson 1899).

For those villages that came into contact with fur traders probably the major change in the aboriginal seasonal round was the expansion of trapping effort in terms of the number of pelts harvested and the establishment of trapping camps. Because of the demand for pelts and the local desire for trade goods, men and their families moved out to camps

for extensive period of time in order to harvest furbearers. It is probable that the furbearer harvest after contact with traders was expanded over aboriginal levels due to the outside stimulus and the desire to obtain non-local goods not available any other way (Wolfe 1979). However, fluctuations in the world fur market result in variability in trapping effort and income from year to year.

The advent of new technologies in coastal villages induced some changes in traditional methods and subsistence patterns. By 1912 the Moravians had acquired the first motorized boat on the Kuskokwim River (Oswalt 1963). By the 1930s the use of boats with outboards on the Yukon-Delta coast commenced (Wolfe 1979). According to local respondents, by the 1930s some outboards were also present in the Kwigillingok. In Hooper Bay, Menager (1962) documented that as late as 1928, people were using _qayaq_ when harvesting king salmon, indicating that salmon fishing with motorized boats had not yet occurred.

Motorized boats basically supplanted the _qayaq_ and large skinboats, except in Hooper Bay where the _qayaq_ was still being used for winter seal hunting during 1982. Motorized craft are used like the older forms, but have made travel and harvesting more rapid. They have permitted people to stay at a permanent village site and still exploit resources that are distant from the communities.

The results of incorporation of modern technology into the production system of the coastal communities were mixed. Linen nets, and later nylon gill nets replaced the seal sinew net. The new nets were not as fragile and did not need to be replaced as often. The same is true for wire hardware cloth which replaced wood in the construction of blackfish traps. Other items such as rifles and shotguns replaced such traditional

hunting elements such as bird spears and snares (Nelson 1979). Guns probably facilitated seal hunting by making harvesting methods more efficient, although seal hunters still use harpoons. With the advent of snowmachines in the 1960s the dogteams were supplanted in coastal villages totally in the case of Hooper Bay and Kwigillingok. This had several effects. The harvest of certain species such as tomcod, blackfish, and needlefish, declined since they were no longer needed to provide dogfood for large teams. Snowmachines somewhat altered winter subsistence patterns since in order to harvest the various furbearers and winter fish, it was no longer necessary to move out to winter camps for extended periods of time. The change to motorized transportation, newer technologies and more durable materials have all had some effect on subsistence patterns. The change to non-local goods have also made cash a necessary part of the overall economic system in present-day communities.

POPULATION TRENDS

The relative isolation of the Yukon-Kuskokwim coastal region as described in the previous section resulted in a lack of census data for the study area until the late 1800s. Edward Nelson was the first person to collect census information for the villages south of Cape Romanzof to the Kuskokwim River. As noted earlier, in the winter of 1878-79 he described "Askinuk" (apparently located at the site of present-day Hooper Bay) as having nearly 200 people. He did not list any village on the site of present-day Kwigillingok, but did note settlements in the vicinity: "Chalitmiut" (population 60), "Anogagmute" (no population given) and "Kongiganagamute" (population 175) (Nelson 1882). Many Kwigillingok residents or their parents resided in these settlements prior to moving

to the site of Kwigillingok. The first U.S. Census to take place in this region occurred two years later in 1880, supervised by Ivan Petroff (Rollins, 1978). Thereafter, a census was compiled by the U.S. Government every ten years in Alaska, although the reporting is uneven for the study area (Tables 2 and 3). Father Robaut made a census of the "St. Mary's Mission District" in 1891 (Robaut 1891). At this time he found out that "Eskinok" (Askinuk) or "Naparearmiut" (present day Hooper Bay) had two "casines" (qasgiq) or men's community houses and a population of 170 people. Of the coastal villages near presentday Kwigillingok, only "Chaleitmiut" was surveyed with a population of 200 (Robaut 1891).

The available census information for Hooper Bay indicates that it has always been a fairly large community (Table 2). The census taken during the 1900s show that the population of Hooper Bay has steadily increased during this century. This reflects to the large extent the immigration and consolidation of residents of other communities and settlements into Hooper Bay because of schools and other factors. Hooper Bay residents have roots in the older settlements of "Kashunuk," "Paimiut," and other small settlements as well as "Napayaraq." It also reflects improved availability and quality of medical services to the Delta villages after about the 1950s.

The first available U.S. Census data for Kwigillingok dates from 1920 (Table 3), although Drebert noted the existence of Kwigillingok in 1912. Older residents of Kwigillingok state that this location was a traditional seasonal site for an extended family group. The village of Kwigillingok actually represents a consolidation of residents from other locations including "Chalitmiut," "Anogok" and Kongiganak among others. The data from the 1920s to the 1960s indicates that Kwigillingok as a community was

TABLE 2. CENSUS INFORMATION FOR HOOPER BAY

Date	Community	Population	Source
1880	Askinuk [a]	175	U.S. Census [b] [c]
1890	Askinaghamiut	138	U.S. Census
1891	Eskinok ("Naparearmiut")	170	Fr. Robaut[d]
1900	Naparegarak	197	U.S. Census
1919	Hooper Bay	221	Sullivan [e]
1930	Hooper Bay	209	U.S. Census
1940	Hooper Bay	299	U.S. Census
1950	Hooper Bay	307	U.S. Census
1960	Hooper Bay	470	U.S. Census
1970	Hooper Bay	490	U.S. Census
1980	Hooper Bay	627	U.S. Census[f]
1981	Hooper Bay	646	this study

a This name is a misnomer for this location. The village sited on Hooper Bay was always called Napayaraq by its residents; however, occasionally the residents were known as "Askinagamiut" - literally, "people of the Askinuks" (K. Bell, and K. Mann pers. comm. 1983).

b Some of the 1880 census data came from E. Nelson (1882) however it is unclear as to which villages it applies.

c The data for the years 1880, 1890, 1900, 1930 to 1970 are from Rollins 1978.

d The data for 1891 are from Robaut 1891.

e The data for 1919 are from Sullivan 1919.

f The data for 1980 are from U.S. Bureau of the Census 1980.

TABLE 3. CENSUS INFORMATION FOR KWIGILLINGOK

Date	Community	Population	Source
1920	Quigillingok	104	U.S. Census [a]
1940	Quigilinook	146	U.S. Census
1950	Kwigillingok	245	U.S. Census
1960	Kwigillingok	344	U.S. Census
1970	Kwigillingok	148	U.S. Census [b]
1980	Kwigillingok	354	U.S. Census [c]
1981	Kwigillingok	205	this study [d]

a The data for 1920 to 1970 from Rollins 1978.

b The population decline from 1960 to 1970 is the result of the movement of some village residents to Kongiganak in the mid 1960s.

c The data for 1980 from U.S. Bureau of the Census 1980.

d The disparity between this figure and the previous one is probably indicative of differing census methodology and perhaps some miscalculation during the 1980 census and not of some major outmigration between 1980 and 1981.

growing. As noted for Hooper Bay, this population growth was probably due to a variety of factors including population consolidation and improved medical care. In the 1960s, in response to land fall flooding, many residents of Kwigillingok moved their houses to a knoll about nine miles away, reestablishing the community of Kongiganak. This outmigration resulted in a lower population for Kwigillingok during the 1970s than during the previous 20 years. Kwigillingok's population is again growing, however it is unlikely that it has increased to the amount reported in the 1980 U.S. Census. A census was compiled for this study in 1981 using a village-derived census, which was then updated with assistance from the health aides and other local residents. It showed a population substantially less than estimated by the 1980 Census. There was no indication on the part of community residents and officials that a major outmigration had occurred between 1980 and 1981, so it can be assumed that census methodological variation or errors are the source of most of the variation.

CONTEMPORARY VILLAGE SETTING

The following profiles briefly describe the demography, wage employment opportunities, and infrastructure of each study community during the course of this study. Although the focus of this study was primarily on resource harvest and use activities and the interaction of these activities with local environmental conditions, other components of the community as a whole provide a context for understanding resource harvest and use. This context is described below.

Hooper Bay

As described in Chapter 2, Hooper Bay is built on three knolls close

to the shores of the bay. Currently Hooper Bay residents occupy diverse housing types. On a knoll located on the west bank of the "Napayaraq River," is the site of dense clusters of old owner-built homes interspersed with some homes constructed through state and federal housing programs during the 1970's. The older owner-constructed homes range from single room dwellings to larger structures that often consist of an original structure augmented by one or more additions. Also present in this area of town are the elementary and high schools, the health clinic, the Catholic and Swedish Covenant churches, the city office, the Alaska Native Industries Cooperative Association (ANICA) store, a privately-owned store, a docking facility, and bulk fuel storage tanks. A network of board walks runs the length of the knoll connecting all the buildings.

A gravel road connects the main knoll with the "housing" section of town. This section contains low density housing and new owner-built homes. The area was built as part of state and federally-funded housing projects dating from the mid-1960s and early 1970s (D. Branch and A. Mann pers. comm. 1982). Also present in this area are the post office, United Utilities (telephone) building, the traditional council building, a privately-owned store, and several buildings belonging to the Native village corporation including a store and a recreation center housing a laundromat and snack bar. The recreation center complex was not functioning during the study period due to various difficulties. This area also has a network of boardwalks connecting the buildings.

The third section of town, "Tomaganuk's Hill", is sparsely settled with only a few houses. There are no boardwalks connecting this section to the others, although an electrical line from the "housing" section services some of the residences.

All buildings have electricity generated by an Alaska Village Electric Cooperative (AVEC) generator. Residential telephones are available through United Utilities; however in 1982 only 36 households (including schoolteachers) had listed telephones (United Utilities 1982). There is no running water and sewer system for the community. Both the major sections of town have a well and watering point which supply water for most purposes although many people prefer to collect rainwater and ice for drinking water, drawing well water for other uses. Sewage is handled by individual households using "honeybuckets" and disposing of wastes at several community pits on the outskirts of the residential areas. Trash is also disposed of by individual households at community dumpsites. Houses are predominantly one-story with few rooms and are usually heated by an oil cookstove or heater and/or woodstove. Older houses on the main knoll sometimes have one or more storehouses nearby. Arctic entryways of all houses are used for storage in addition to their function as cold air trap. A few households in the community also have steambaths and/or firebath structures nearby. These structures are few due to the limited availability of wood as fuel.

Hooper Bay is a second class city represented by both a city council and a traditional (IRA) council. Most community members belong to the Roman Catholic church, although the Covenant Church has a small following.

The population of Hooper Bay is relatively young and growing. In 1981 more than 50 percent of the total population (646) was under the age of twenty-five and 82 percent was under the age of fifty (Fig. 2). The small size (less than 2 percent) of the age class between the years of 40 and 44 is noteworthy as is the small size of the age classes between 1 and 9, although no specific data was gathered on these phenomena during

age	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80+	unknown	total
# of males	37	34	29	38	50	41	24	14	9	13	12	14	8	7	5	4	2	5	346
# of females	24	20	35	44	55	31	16	11	2	10	11	13	8	3	7	2	3	5	300

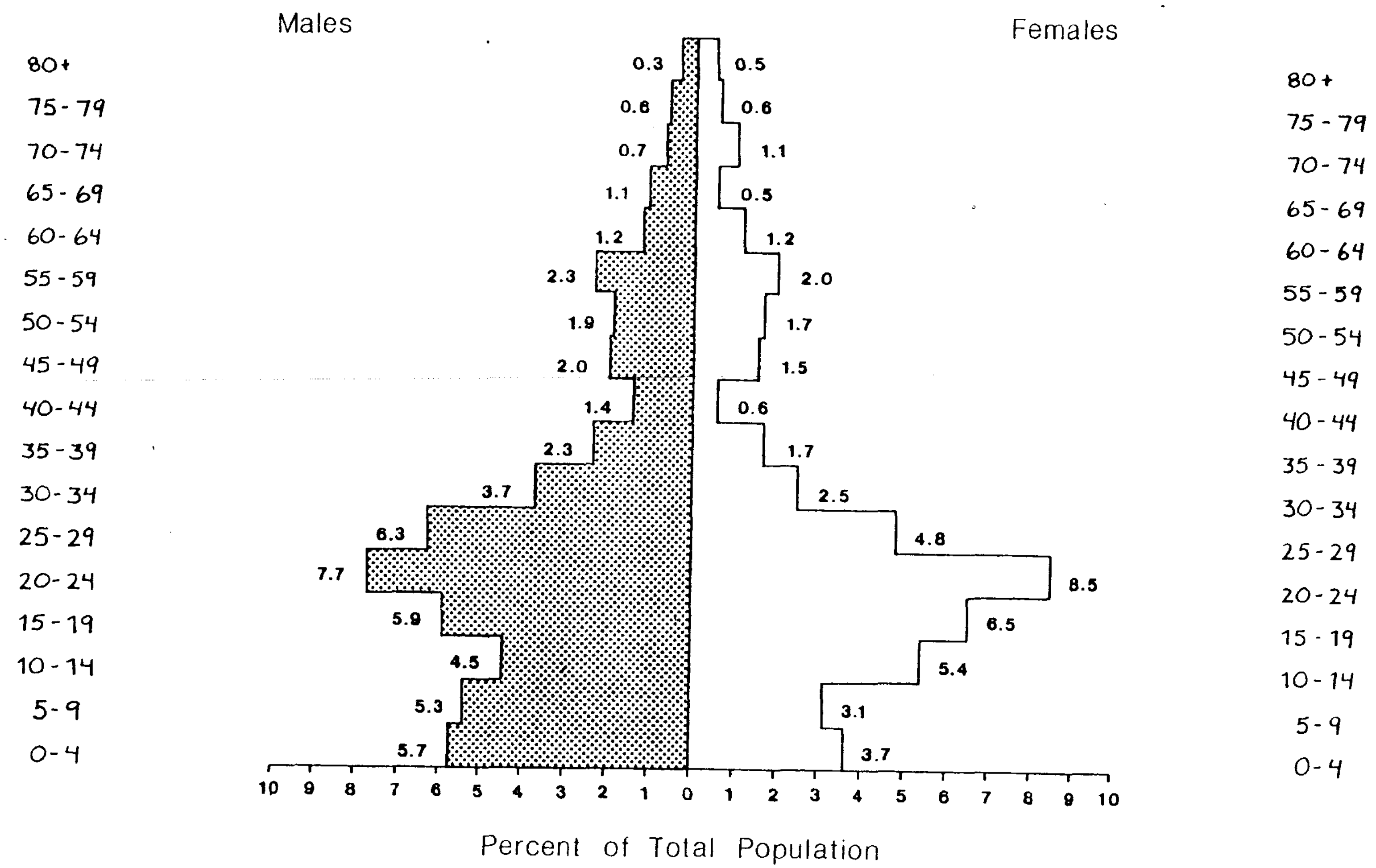


Fig. 2. Age and sex characteristics of Hooper Bay's population (N=646), December 1981.

the course of the study. The sex ratio for Hooper Bay's population is 54 percent male to 46 percent female. The age classes between 15 and 24 years of age make up nearly thirty percent (28.6) of the total population.

Hooper Bay consisted of 95 households in 1981, with a mean household size of 6.8 members, and a mode and median size of 6 members. Household size ranges from 1 to 14 members (Fig. 3). Despite the relative youth of the population, the heads of household are predominantly males older than 50 years of age (Fig. 4). In 1981, these older men headed 48 percent (46) of the households, with men between the ages of 39 to 49 years of age heading 32 percent (30) of the households. Many of these older heads of household are still physically active in many resource related pursuits. Those who have relegated subsistence activities to their children still offer direction and knowledge.

An important component of contemporary Hooper Bay is the cash sector of the economy. Generally, these coastal communities would be characterized as having a "mixed economy" which Wolfe (1983) identified as having mutually supportive "market" and "subsistence" sectors. A "mixed" economic system is characterized by a reliable subsistence sector, monetary earnings which are invested in equipment for resource harvesting, and wage opportunities which are few, seasonable in nature, often part-time, and low paying (Wolfe 1983). Hooper Bay appears to fall into this economic category.

Table 4 presents the available wage opportunities with Hooper Bay during 1982. Occasionally there are federally funded youth programs that take place during the summer months. Other cash income may be derived from the fishing industry. Some people leave to work in fish processing plants on the Yukon River at Emmonak and Mt. Village during the summer,

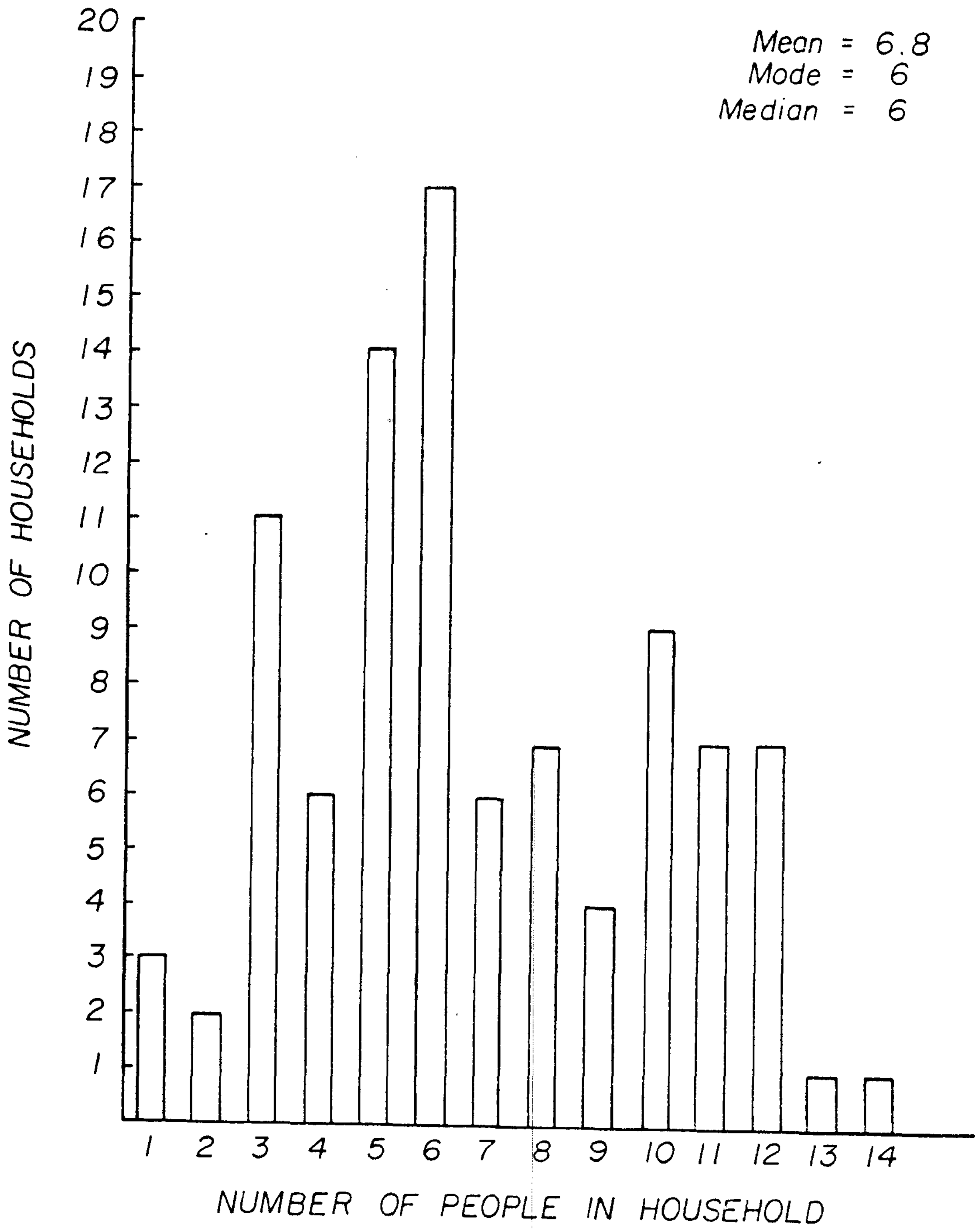


Fig. 3. Size of Hooper Bay households (N=95), December 1981.

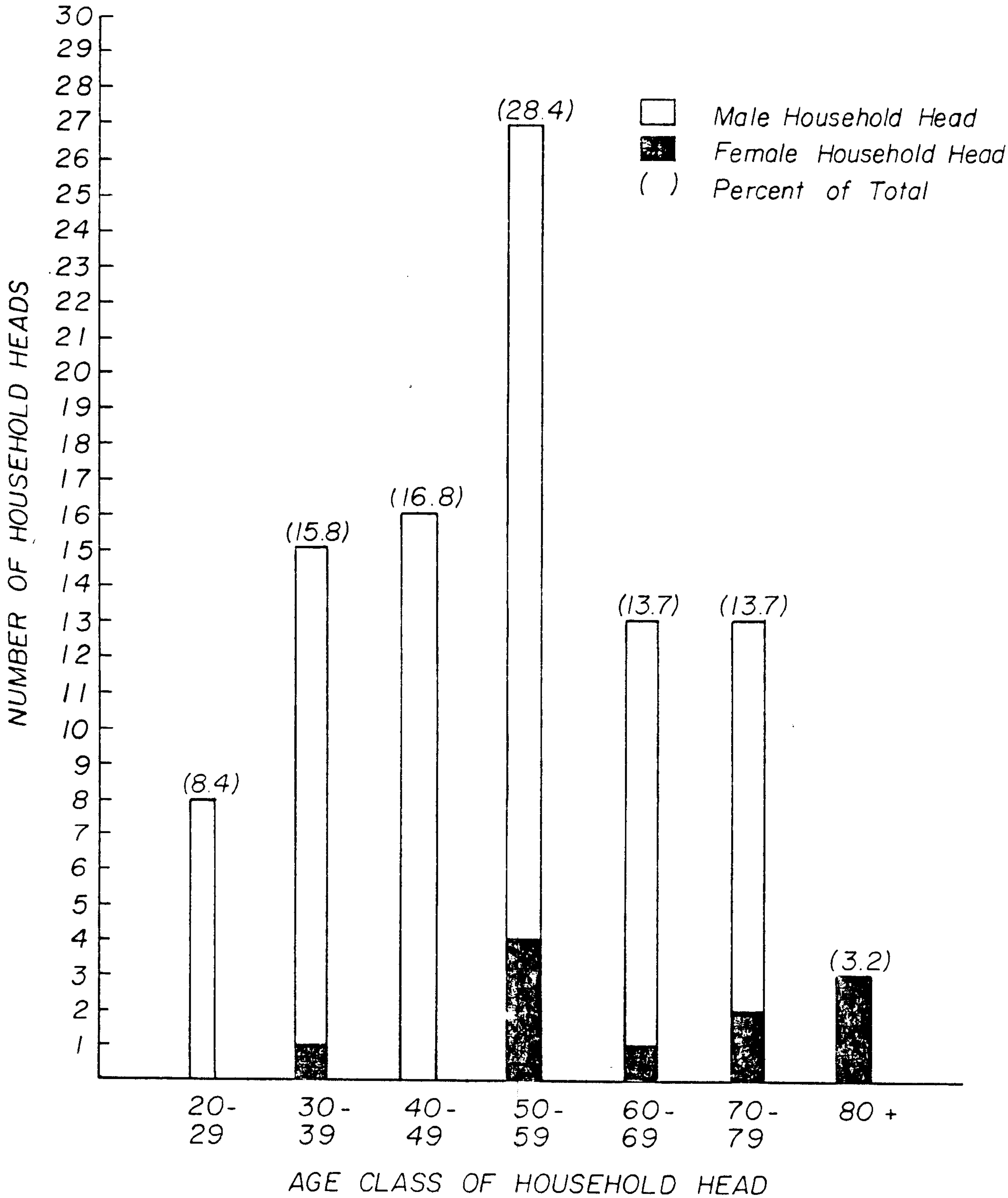


Fig. 4. Age class of Hooper Bay heads of household (N=95), December 1981.

TABLE 4. HOOPER BAY WAGE EMPLOYMENT OPPORTUNITIES, 1982

Employer and Position	Full Time	Part Time
Lower Yukon School District[a]		
Teacher Aid	6	
Special Education	2	
Indian Education	2	
Bilingual Education	2	
Student Teacher	1	
Cook	2	1 (30 hrs/wk)
Maintenance	4	
Secretary	1	
Health Clinic		
Primary Health Aide	3	
Alternate		1 (when needed)
Maintenance		1 (2 hr/day)
Kuskokwim Community College		
Village Representative		1 (4 hr/day)
Headstart[b]		
Teacher/Director	1	
Teacher Aide	1	
Cook	1	
Maintenance	1	
Alternate		on call
Public Safety		
Village Public Safety Officer (VPSO)	1	
City Police	2	
Safety Officer	1	
Magistrate		1 (30 hr/wk)
City Administration		
Administrator	1	
Assistant Administrator	1	
Clerk	1	
Janitor		1
Alcohol Counselor		1
Food Stamp Fee Agent		1
Maintenance	2	
Alaska Village Electric Cooperative		
Power Plant Operator	1	

TABLE 4. CONTINUED

Employer and Position	Full Time	Part Time
Alaska Native Industries Cooperative Association		
Manager	1	
Bookkeeper Secretary	2	
Clerk	2	
Mechanics	2	
Maintenance	1	
Janitor	1	
Sea Lion Corporation Store		
Manager	1	
Bookkeeper Secretary	2	
Clerk	1	
Transportation		
Wien Agent[c]	1	1 (as needed)
Seairmotive Agent	1	
Airport Maintenance	1	
Post Office		
Postmistress	1	1
Alternate		1 (as needed)
Traditional (IRA) Council		
Land Planner	1	
Maintenance		4 (4 hr/day)
National Guard[d]		
Village leader	1	
Guardsmen		30
Private Business (4)	1	3 (4-25 hrs/wk)
Miscellaneous		
Homemaker's Program		5 (2 hrs/day)
School Babysitters	6	
Librarian		1
Social Service Director	1	
Catholic Church		1 (1 hr/wk)

a Most school positions are for 9 months.
b The Headstart Program operates from October through May.
c In August of 1983, Wien discontinued its flights to the villages.
d National Guard duties usually take place on weekends during the winter.

although the level of participation is unknown and would most likely involve young adults. There is only one Hooper Bay resident who holds a Commercial Fisheries Entry Commission (CFEC) salmon fishing permit for the Yukon River. Hooper Bay fishermen are not involved in the Kuskokwim River or Bristol Bay salmon fisheries. In 1980 a commercial herring fishery was opened in Kokechik Bay (Cape Romanzof) north of Hooper Bay. This fishery represents the first commercial fishery in proximity the village. In 1983, 63 people had permits to fish in this fishery.

Occasionally, fire fighting in other areas of the State provides some employment in the summer, but this occurs sporadically. Some people also leave the community for several months or years seeking non-local employment with the intent of returning to Hooper Bay. The number of people in this category is unknown for purposes of this study.

Most of the wage opportunities within the community are funded by government sources, whether the federal, state, or local government. The largest employer is the state school system (Table 4). Most of the jobs open to local residents during the study period were in the classified services (not certified teachers) and lasted nine months. Other state-funded positions include the village public safety officer, magistrate, and National guardsmen. The post office is federally funded, as are some of the health aide and head-start positions. The city of Hooper Bay also provides a variety of wage opportunities. Private employers are not numerous. Generally, the number of full-time jobs available to the community of 646 people is relatively few, with part-time and seasonal work making up the rest of the limited wage opportunities available to Hooper Bay residents.

Transfer payments are another component of the cash sector under

State and Federal programs. Table 5 delineates four major types of aid and the annual community disbursements. In 1982, 37 percent (35) of the Hooper Bay households qualified for aid on the basis that at least one member was permanently disabled or old. Food stamp participation fluctuates throughout the year generally being highest during the winter months and lowest during the summer months when food resources are most numerous. With limited job opportunities, transfer payments assist some families in paying the high cost of stove oil or store supplies. However, the amount of aid given to a household is usually insufficient to provide for all the needs of a large household given the expense of most goods brought into the community.

A final source of cash income for Hooper Bay residents is self-employment. The major forms of self-employment include commercial herring fishing, commercial fur trapping, ivory carving, and basket weaving. Commercial fishing for herring and trapping are relatively short term, labor intensive and require an investment of equipment that is often expensive to maintain or replace and capital. Enterprises such as basketweaving, do not require a large investment of equipment and capital, but are quite labor intensive over a longer period of time. For many households in Hooper Bay, self-employment in commercial fishing, trapping, and basketweaving by one or more members represents a major source of cash.

Having some flow of cash into a household is now necessary because most of the technology and fuel used in resource harvest activities must be purchased. Two studies have shown that active participation in the wage and commercial sector often permits more active participation in the subsistence sector (Kruse 1982; Wolfe 1979; Wolfe 1983). Because of the

TABLE 5. TRANSFER PAYMENTS, HOOPER BAY, 1981

	Old Age[b] Assistance	Aid to the Permaanently Disabled[a]	Aid to Families with Dependent Children	Food Stamps[b]
Number of Households	20	15	37	26-52
Percentage of Total Households	21	16	39	27-55
Annual Community Disbursement	$257,904	$117,936	$250,692	$143,458[c]

Source: Alaska Department of Health and Social Services, Division of Public Assistance (1982).

a These programs include all social security related programs.

b The number of participating households fluctuate monthly. This figure represents the range of households participating during 1981.

c Estimated amounts of average payments over one year's time.

few available jobs and the relatively limited nature of the commercial sector, the average household income of Hooper Bay residents is relatively low. The 1979 median income in Hooper Bay was $13,558, less than $2,000 per capita annually for an average household size of 6.8 members. The wild, renewable resources available to Hooper Bay residents provide them with an economic base on which to support the community. The wage and commercial sectors help support efforts in the subsistence sector.

Kwigillingok

During the study period, Kwigillingok was an unincorporated community of 35 households. As noted earlier, the low topographic relief of land in this coastal village has resulted in a low density housing pattern which extends over a large area. Most of the houses and service buildings are located in the section of the village closest to the sea. Bounded to the south by a small slough, this part of town is the site of the elementary school, the Moravian Church, the Russian Orthodox Church, two small stores, the health clinic, post office, community hall, and city council office. One boardwalk extends the length of the village with a network of shorter branches connecting most houses, clusters of houses, and buildings.

The upper half of the village contains fewer houses, the electrical generator, and the high school. A half-mile long road that leads to the airstrip begins in this part of town.

Dwellings range in age from those built in the 1920s to 1940s, which replaced sod houses, to newer, owner built houses constructed within the last decade. There have been no federally or state-funded housing projects in Kwigillingok, except for teacher housing. There is no water and

sewer system in Kwigillingok nor is there a community well. A large cistern built by the Moravian Church collects rainwater for community use. Individual households collect their own rainwater in barrels or go far upstream to draw fresh water. In the winter, residents collect freshwater ice and snow from locations distant from the village, which is melted for home use. Sewage is handled by a "honeybucket" system within the homes and disposed of in pits located throughout the village. Trash is either burned or taken across the river to a communal dump site.

Houses are heated by stove oil cookstoves, heaters, and/or furnaces. The use of wood burning stoves is limited. Most houses have adjacent storage buildings and drying racks for fish and meat. A few households use a large arctic entryway as their sole storage area. Steambath buildings are numerous in Kwigillingok, with over 40 percent of the houses having one. The village was served by a single public telephone until early 1983. At present there are five phones in the community, and more are to be installed in 1984 after the generator is upgraded. Kwigillingok residents only recently were able to receive satellite television reception. The installation and hook-up of a satellite "dish" took place in the summer of 1982. Most residents are members of the Moravian church, while others are Russian Orthodox. Kwigillingok is unincorporated and governed by a traditional village council which oversees village administration.

The population profile of Kwigillingok in 1981 (Fig. 5) shows that 56 percent of the population was under the age of 25 years, while nearly 81 percent was under the age of 50. People within the age class of 15 to 24 years made up over 30 percent of the total population. As in Hooper Bay those people between the ages of 40 and 44 years make up the

age	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80+	unknown	total
# of males	9	6	16	20	7	10	10	3	2	5	4	3	4	5	0	1	0	3	108
# of females	2	9	10	15	20	6	3	5	2	5	5	3	0	5	2	0	1	4	97

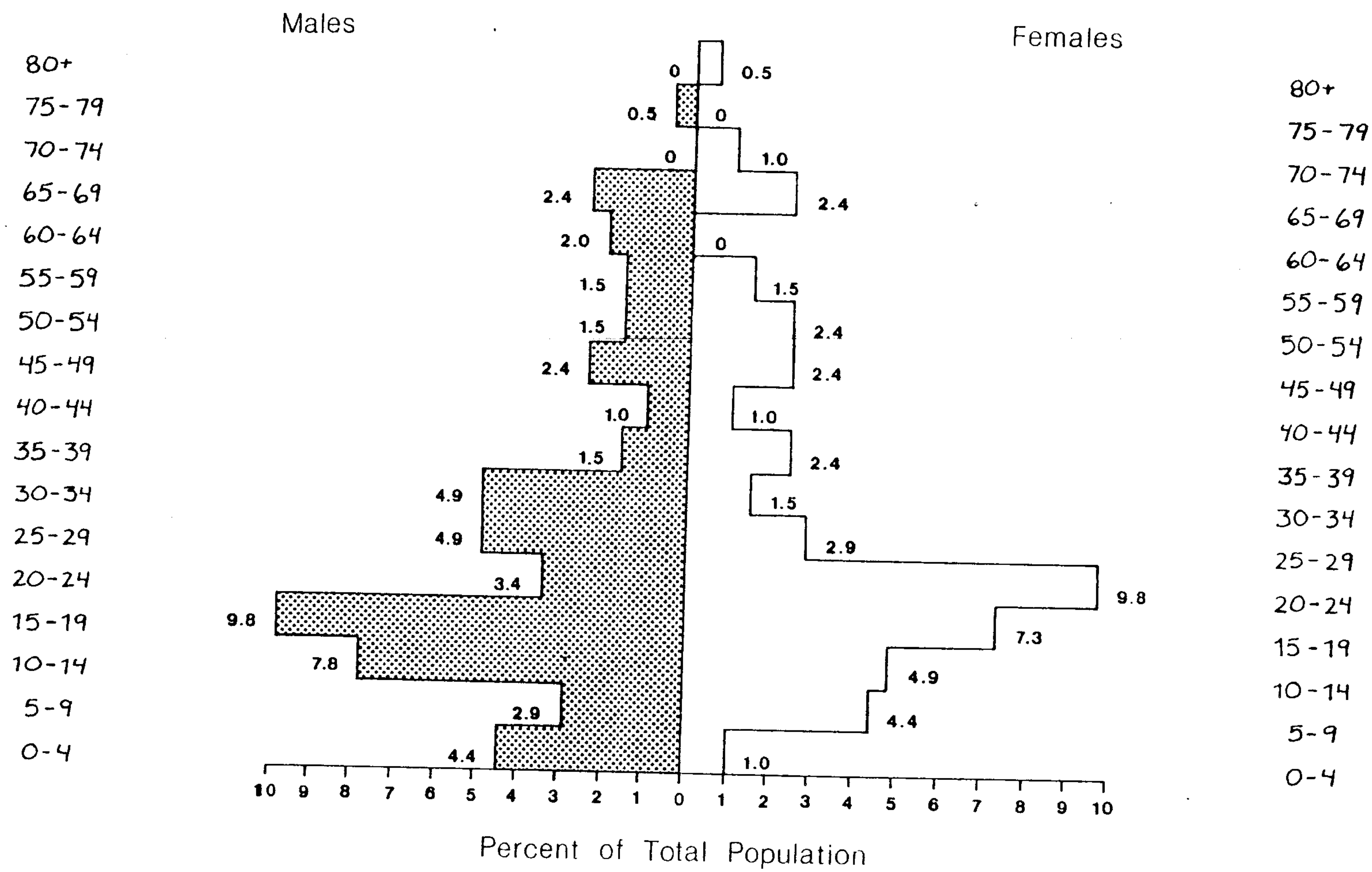


Fig. 5. Age and sex characteristics of Kwigillingok's population (N=215), December 1981.

smallest age class in Kwigillingok, and children between the ages of 1 and 9 are also smaller than might be expected. Again, no specific data on these phenomena was gathered during the course of this study.

The mean household size in Kwigillingok is 5.9 members, with a range of household size from 1 to 10 among its 35 households (Fig. 6). Median household size is 6 with a mode of 7. Despite the relative youthfulness of the population, households are most often headed by males over the age of 50 years (Fig. 7). This group heads 43 percent of all households, although they represent only 16 percent of the total population. Most of these men remain physically active, participating in many resource activities and guiding other members of their household or family in other activities.

The small size of Kwigillingok and its unincorporated status results in a few wage opportunities being present within the community. As is the case in Hooper Bay, most jobs available in Kwigillingok are funded by various government sources. The school district is the single largest employer, providing 9-month positions primarily in the classified (non-teacher) service (Table 6). There are few private employers in Kwigillingok. Full-time jobs are limited and other jobs available are part-time or seasonal in nature.

Transfer programs from state and federal agencies are also a component of the cash sector (Table 7). Twenty-three percent of the households qualified for aid in 1981, because one or more members were elderly and 14 percent of the households had at least one member who was permanently disabled. Foodstamp participation fluctuates throughout the year, usually being highest in the winter months and lowest during the summer when households are fishing.

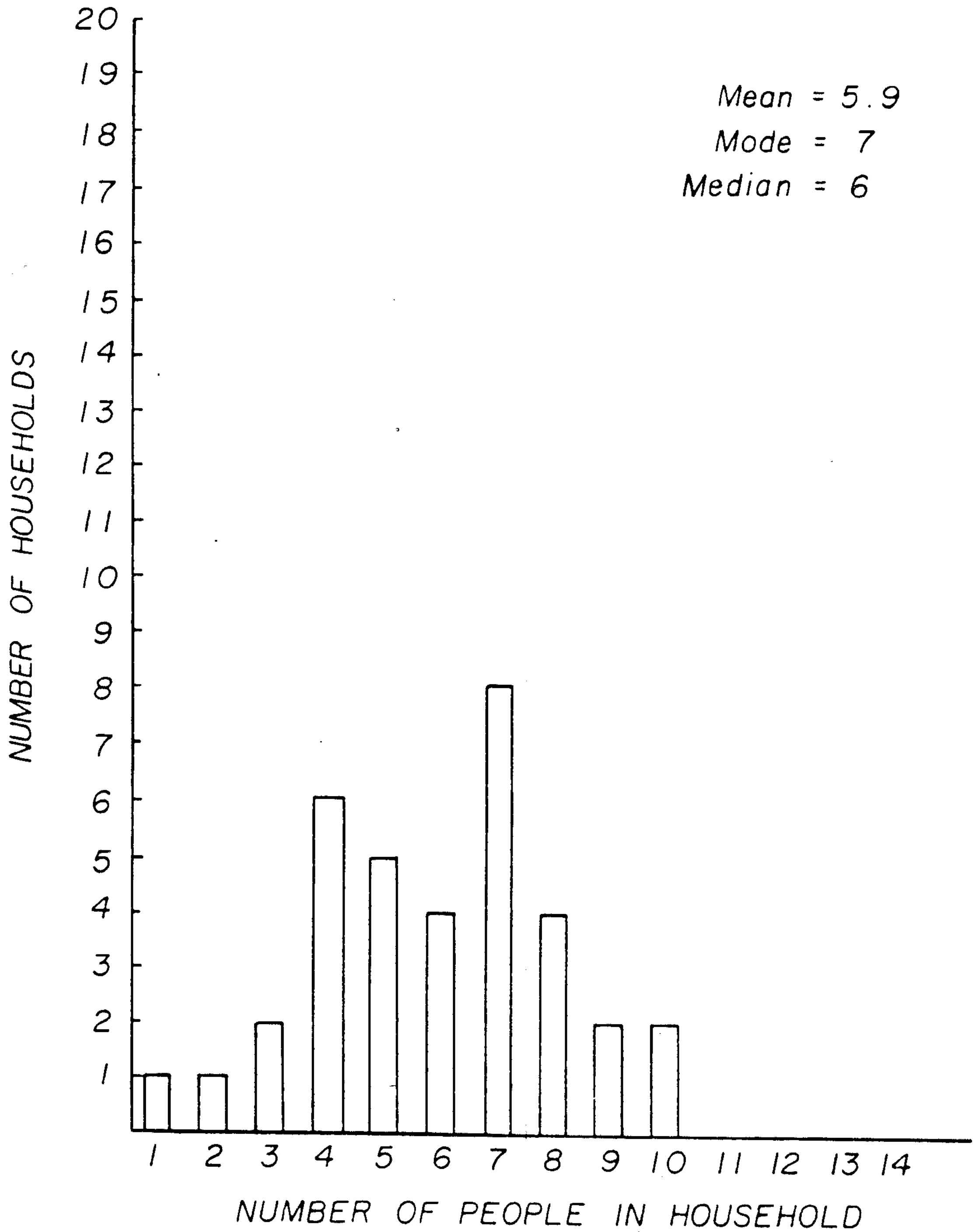


Fig. 6. Size of Kwigillingok households (N=35), December 1981.

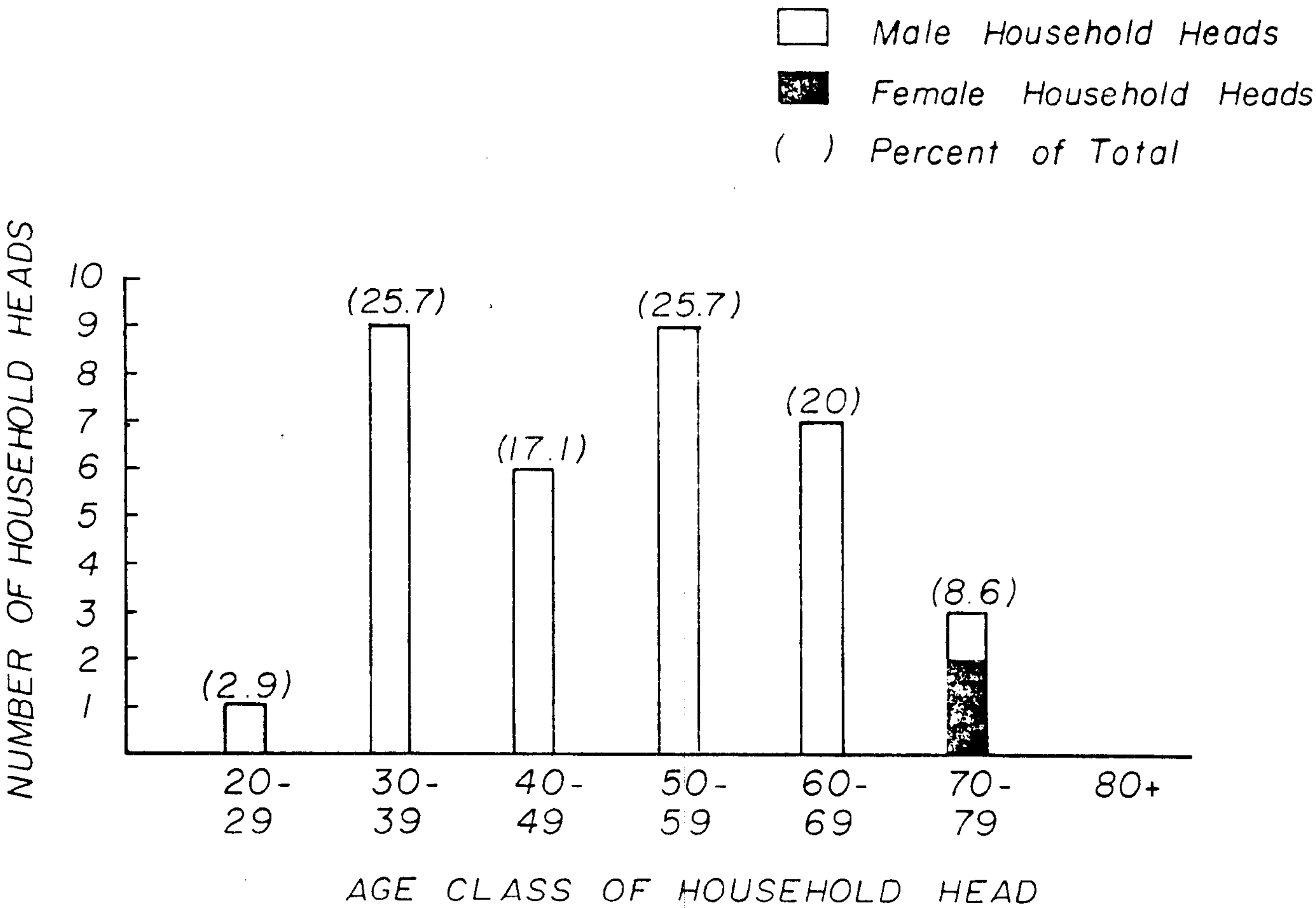


Fig. 7. Age class of Kwigillingok heads of household (N=35), December 1981.

TABLE 6. KWIGILLINGOK WAGE EMPLOYMENT OPPORTUNITIES, 1982

Employer and Position	Full Time	Part Time
Lower Kuskokwim School District[a]		
Teacher Aides	4	
Bilingual Education	3	
Indian/Special Education	1	
Cook	2	1
Secretary	1	
Maintenance	4	1
Housing Contruction[b]	4	
Cultural Instruction[c]		8 to 9
Health Clinic		
Primary Health Aide	1	
Alternate		1 (as needed)
Janitor/Maintenance		1
Public Safety		
Village Public Safety Officer	1	
Village Administration		
Project Director	1	
Bookkeeper	1	
Assistant		1
Boardwalk Maintenance		1
Village Power Plant Opertor	2	
Kwik, Inc. (Store)		
Manager	1	
Bookkeeper	1	
Clerk	3	
Maintenance		1
"Caniq" Coop Store		
Manager	1	
Clerk	1	1 or 2
Transportation		
Wien Agent[d]		1 (variable hours)
Seair Agent		1 (daily)
Airport Maintenance		1
Post Office		
Postmistress	1	
Alternate		1

TABLE 6. CONTINUED

Employer and Position	Full Time	Part Time
National Guard[e]		
Guardsmen	20	
Miscellaneous		
School Babysitters		2
Librarian		1
Social Service Representative	1	
Fee Agent		1

a Most of these positions are nine-month in duration.
b This job category is of limited duration.
c Some village residents are hired for one week to teach traditional skills.
d In August 1983, Wien discontinued its flights to this village.
e National Guard duties usually take place on weekends during the winter.

TABLE 7. TRANSFER PAYMENTS, KWIGILLINGOK, 1981

	Old Age[b] Assistance	Aid to the Permanently Disabled[a]	Aid to Families with Dependent Children	Food Stamps[b]
Number of Households	8	5	5	6-12
Percent of total households	23	14	14	17-34
Annual Community Disbursements	$85,968	$39,312	$23,304	$33,099[c]

Source: Alaska Department of Health and Social Services, Division of Public Assistance (1982).

a These aid programs include all Social Security related programs.

b This program fluctuates monthly. The figure indicates the range of participants during 1981.

c Estimated value of average payments over one year's time.

Self-employment is a major component of the cash sector in the community. Fifteen households have members with Commercial Fisheries Entry Commission (CFEC) permits for salmon fishing in the Kuskokwim District and four people have permits for salmon fishing in Bristol Bay. In the winter of 1981 and 1982, 34 percent of the households had members who participated in harvesting furs for commercial sale. More were involved in trapping for domestic use. These two activities tend to be expensive because of the cost of the necessary technology equipment and capital required, and take place only during a few months each year. Commercial fishing is a more expensive activity than trapping, but the returns are usually greater. Basket weaving, skin sewing, ivory carving and other crafts production are less expensive in terms of capital and equipment investment and are not restricted in time. Most households have at least one member who generates cash income through some form of self-employment. As at Hooper Bay, cash is necessary to purchase equipment, fuels, stove oil, and other commodities. Income figures for 1979 indicate that the median household income for three villages in this area (Kipnuk, Kongiganak, and Kwigillingok) was $13,991, or $2371 per household member in Kwigillingok (U.S. Census 1982). Despite the fact that many households are involved in commercial salmon fishing, income from this source is generally not high. The Kuskokwim fishery remains one of the lowest paying fisheries in the state. Lower river fishermen on average earned less than $5000 annually between 1981 and 1983.

This chapter has been a brief overview of the historical contact period, aboriginal settlement and subsistence patterns, census information for the two study communities and present community characteristics. The information that has been included is not intended to be exhaustive.

Rather the description of past history and contemporary characteristics is intended to broaden the understanding of the study communities. The information from Chapters 2 and 3 provides a contextual framework with which to examine the resource harvesting activities of Hooper Bay and Kwigillingok which will be presented in subsequent chapters.

CHAPTER 4

SPRING

ENVIRONMENTAL CHARACTERISTICS

Springtime comes to Yukon-Kuskokwim Delta coast during the months of March, April and May. The period of spring is generally characterized by gradually warming temperatures with monthly averages ranging from 11 degrees Fahrenheit (March) to 40 degrees Fahrenheit (May), steadily increasing daylight (13 hours by the end of March and gaining at the rate of 6 minutes a day) (National Weather Service per. comm. 1983) and the breakup of the pack ice that normally dominates the Bering Sea in this area all winter as well as the ice on the many streams and ponds. The movement of pack ice is fairly dynamic throughout the winter, but by March it is breaking up and starting to retreat northward. This trend intensifies through April and May. Concurrently the shorefast ice starts rotting, reaching its peak of disintegration by late April and early May. The ice in ponds, rivers and streams start disintegrating later than the ocean ice, but their breakup also reaches its peak in late April to mid May. Often the breakup of land ice, the melting of snow and the inability of the frozen tundra to absorb water, results in standing melt water on the tundra. Occasionally, the levels of melt water produced are enough to cause moderate flooding which has important implications for the many species that nest or den on the tundra. As the pack ice breaks up and retreats northward, several species of wildlife follow in its wake. Some species are associated with the ice and migrate to stay within its proximity while other species move back into areas they could not occupy

while the ice was present. This period of intensive migrations brings many wild resources near the coast and signals the start of a new annual round of resource activities for the coastal communities. The following sections describe some of the major wildlife resources and the harvest activities of area residents during spring.

BIOLOGICAL CHARACTERISTICS OF SPRING SPECIES

Seals

Seals are among the first migratory marine species to pass within range of Kwigillingok and Hooper Bay during spring. They usually represent the first significant source of fresh meat to communities that have been utilizing dwindling supplies of frozen and dried fish and other wild foods all winter. They also provide raw materials for clothing and other products as well the oil people use as the accompaniment to most meals. The three species commonly harvested by village residents are ringed seals (*nayiq*, *Phoca hispida*), spotted seals (*issuriq*, *Phoca vitulina largha*), and bearded seals (*maklak*, *Erignathus barbatus*) (Burns 1978).

The ringed seal is an arctic animal closely associated with pack ice (Banfield 1974; Nelson 1979). A solitary animal, its highest population densities are found in the vicinity of shorefast ice throughout the year (Banfield 1974). During the summer, when the icepack is at its most restricted distribution ringed seals are found in the northern Chuckchi and Beaufort seas. The seals make seasonal migrations along the subarctic coast following the northern and southern movements of the ice (Burns 1978).

The ringed seal is not known to be wary during the spring and can

often be approached closely, which makes it easier to hunt than other seal species such as spotted seals. The males fast during the breeding season, mid-March through mid-May (Banfield 1974). At that time, they also develop a strong smell similar to gasoline (Burns 1978). The villagers called them tegak ("stinky") at this time. Hunters do not want to harvest the males at this time as their meat is considered unpalatable, but they will pursue ringed seals in anticipation of harvesting females.

Spotted seals usually inhabit coastal waters of the Bering Sea during the ice free seasons, but are displaced as the ice pack advances southward during the fall. They winter along the front of the ice pack and southward, as these marine mammals are actually a north temperate zone species and their association with sea ice occurs only seasonally (Burns 1978). As the pack ice breaks up in spring, spotted seals move back into shore and are often seen hauled out on remnant shorefast ice or ice floes. In the Bering Sea, they often have their pups on the ice (Burns 1978). While spotted seals tend to be solitary in their habits in open water, they are gregarious on land. During the summer they can be spotted in tidal bays, river mouths and hauled up on exposed sand bars. Unlike ringed seals, spotted seals are cautious animals and are difficult to approach closely.

Bearded seals are a subarctic species associated with sea ice, making seasonal migrations which follow the movement of the pack ice. The pack ice occupies a large area of the Bering Sea during the winter, and bearded seals are widely dispersed in the unstable "flaw zones" or areas of drifting ice (Burns 1978). However, as the pack ice breaks up and retreats northward in the spring, the population density in a given area may increase markedly. Adult bearded seals usually remain in close

association with the sea ice and migrate northward with it in the spring, while younger seals may remain in ice-free areas, frequenting bays and estuaries. During the spring, when seals are often found on ice floes, they show little wariness and often "freeze" when they are approached by a hunter (Burns 1978; Banfield 1974). The adult males are very vocal during the spring, a trait apparently associated with courtship (Burns 1978). Hunters from some coastal villages use their cries as one means of locating bearded seals.

As mentioned previously spring brings increasing daylight, warmer temperatures and the gradual break up of the pack and shorefast ice. Movement of the three species of seals are intensified during this time. The ice-associated seals (ringed and bearded) follow the pack ice northward. The ringed seal maintains its association with the shore ice as it migrates northward, and the bearded seal moves in closer to shore as more "flaw zones" and areas of drifting ice are created by the breakup of both the shorefast and pack ice. Spotted seals move back into the shallow coastal areas from which they were displaced by the pack ice. Therefore, at this time, all three species can be found near the coastal areas, making spring the most productive time to hunt these marine animals.

Walrus

The spring breakup and retreat of the ice pack, bringing about the northward movement of seal, also signals the start of the walrus migration. Walruses are an ice-associated animal. Except for a herd of males that spends the summer at islands in Bristol Bay, the majority of the north Pacific walrus population follows the ice northward through the Bering Strait to summer in the Chukchi sea. Although the major migration route

appears to be west of Nunivak Island (Fay 1981) animals on the periphery swim close to the north shore of Kuskokwim Bay and through the Etolin Straits. Although they appear near to shore in the vicinity of Kwigillingok, they apparently veer northwest after passing through Etolin Straits, as hunters in Hooper Bay stated that it was uncommon for them to sight walrus during the spring. When they did, the walrus were usually swimming far offshore. They are not known to haul out on land near either of the two villages.

Walrus tend to travel in herds which are usually differentiated by age and sex. When they are migrating through an area, they may only be present for a very short time, but when present, usually will be encountered in groups. The peak of this migration near Kuskokwim Bay generally occurs after seal hunting is in full swing, usually around the end of April or beginning of May, although random animals may be taken before this time.

Waterfowl

There are two distinct categories of waterfowl that are hunted by the coastal communities considered in this study. One group is the eiders (king, common, Steller's, and spectacled), which breed in the high arctic but winter below the southern edge of the pack ice. These birds are usually available around the two villages from March through May, although this will vary depending on the ice conditions. Residents noted that during years of no pack ice and limited shorefast ice, eiders may be found off the coast during the late winter months (January through March). As the ice retreats northward, the eiders follow their migrations, peaking in late April to early May. The common eiders tend to be

the earliest group to show up in abundance, followed by flocks of king eiders. The Steller's and spectacled eiders tend to be interspersed in lower numbers throughout the larger flocks of the other species. The eiders that congregate near or south of Hooper Bay tend to migrate through the Bay or along the coast until they reach Dall Point. Here they swerve to the northwest and are not found close to mainland areas to the north. The other major category of waterfowl which is important to the coastal residents are the summer migrants -- the ducks, geese and swans of the Pacific Flyway that may winter as far south as Mexico, but return each spring to nest in Alaska and Siberia (Udvardy 1977). These summer migrants start showing up off the ice anywhere from late March to late April, depending on the snow and ice conditions, but usually start flying overland in mid-April. They usually nest by May, molt by late summer, and start their migration south again by late August to early October. Other summer migrants will include various species of shorebirds as well as cranes. These also provide food for coastal residents.

The major migratory route for waterfowl appears to be west of Kuskokwim Bay along the Bering Sea coast. The richest nesting grounds are around the region between Nelson Island and the Askinuk Mountains. There are breeding grounds in this area that support dense colonies of geese especially Pacific brant and Cackling canada geese (Byrd et al. 1982). Kwigillingok residents noted that they had access to only a minor segment of the migrating birds during the spring; the major migration appeared off the coast near Kipnuk and headed north. While various species of ducks and geese nest in the coastal plain around Kwigillingok, this area does not support the densities of waterfowl that are found in the nesting colonies located near Hooper Bay (Byrd et al. 1982).

Waterfowl and Other Bird Eggs

The Yukon-Kuskokwim Delta coast provides nesting habitat for a myriad of species of waterfowl, seabirds, cranes, gulls, and terns, as well as some passerine (songbird) and ptarmigan species. These bird species initiate nesting as soon as the tundra is free of snow and melt water. During years with early or moderate springs, nest initiation may begin by mid-May, although during years with persistent snow cover and subsequent melt water, the start of nesting may be pushed back into June (Byrd et al. 1982). The late initiation of nests can result in a lower incidence of nesting success (Byrd, et al. 1982; Reiswig, pers. comm. 1982), but other factors may influence nesting success as well. The incubation period for most species is usually less than a month (Terres 1982) so eggs are usually available to coastal residents on a restricted time basis. Nesting density of birds will also vary by species and area. Gulls (mainly glaucous gulls, Larus hyperboreus, and glaucous winged gulls, Larus glaucescens) tend to nest in colonies on flat, low islands and often in lakes, rocky beaches, and cliff ledges (Armstrong 1980), while swans may require large areas as territory for a single nest (Terres 1982). The coastal fringe between Nelson Island and the Askinuk Mountains is the site of dense nesting colonies for brant (Branta bernicula) as well as concentrations of emperor geese (Philacte canagica), Canada geese (Branta canadensis) including the cackling canada geese (B.C. minima), as well as other waterfowl species (Byrd et al 1982). The coastal plain around Kwigillingok is generally favorable habitat for various waterfowl species, but the nesting densities are usually less than those found in the area around Hooper Bay.

Beaver

Beaver (*Castor canadensis*) historically were not present along the coastal fringe of the Yukon-Kuskokwim Delta. Around both Hooper Bay and Kwigillingok they were unknown until the past two decades. Little is known by biologists about the intrusion of beaver. Local people report that the beaver are expanding westward from the Kuskokwim and Yukon Rivers. East of Hooper Bay they are now present around the middle Kashunuk River drainage and near the Askinuk Mountains. They are generally present all around Kwigillingok where they have occured since the 1960s.

Beaver are the largest species of rodents. They are well known for their stream-altering characteristics, as they tend to build dams that turn free-running streams into ponds. They are usually associated with more wooded environments than tundra areas. They appear to have been unable to colonize the high arctic tundra because of the presence of thick winter ice that might prevent access to stored food. Tundra areas lack the extensive amounts of essential woody plants which serve as winter food and are used in the construction of dams and houses (Hill 1982). Nonetheless, beaver appear to be establishing themselves rapidly in the coastal tundra habitat of the Yukon-Kuskokwim delta.

A prominent feature of beaver behavior is the dispersal of two-year old animals. These animals have been known to travel up to 238 kilometers (148 miles) (Hubbard 1958). In areas with extensive winter ice, the dispersal of animals tends to be restricted to the summer months (Hill 1982).

Muskrat

Muskrat (*Ondatra zibethicus*) are moderately large rodents that are

associated with ponds and streams and other water systems. They nest by digging burrows in banks or houses made of vegetation (Perry 1982). These nests are well insulated and provide the muskrat with protection against extremes in ambient temperature. Another winter adaptation is the construction of "pushups," which are generally associated with frozen marshes and snow. The muskrat cut a small hole in the ice and push up a pile of submergent vegetative debris, which forms a type of enclosed cavity. Pushups serve as rest sites and as feeding stations during severe weather. Muskrats will construct enough of these pushups within their home ranges to allow short feeding excursions to all points of the range and reduce the time exposed to cold water (Perry 1982).

Herring

Herring (*Clupea harengus*) migrate to spawn in the near shore waters off the coast of the Yukon-Kuskokwim Delta following the break up of shore ice. Although the ice may not be totally gone during the spawning run, a major determinant of run timing occurs when the inshore water temperature reaches 37.4 to 54 degrees Fahrenheit (Hart, 1973). The spawning of herring is unevenly distributed along the coast, with major concentrations of spawning occuring in or around Security Cove, Goodnews Bay, Nelson Island and Kokechik Bay. There may be other areas of limited spawning, but this is less well documented.

Herring are rather small fish, averaging 10 inches in length (Morrow, 1980). They travel in massive schools, wintering in deep offshore waters. Their spawning runs are of limited duration, making them accessible to coastal residents no more than a few weeks each year. In some areas of the coast, such as Hooper Bay and Kwigillingok, the fish that appear in the near vicinity are not spawning according to local residents. They

believe them to be adjunct to a spawning stock, specifically those of Kokechik Bay and Nelson Island, respectively. When they are present, they arrive en masse, but they leave as quickly as they come. They are therefore accessible only during a short period of time.

Whitefish

The Bering cisco (imarrpinraq, Kwigillingok; naptaq, Hooper Bay; *Coregonus laurettae*) is the predominant whitefish along the coastal fringe of the Yukon-Kuskokwim Delta, a small, silvery fish averaging 11 inches in length (Morrow 1980). Despite this fact, there is very little biological information about this species (Morrow, 1980). Its habits seem to vary depending on the section of the coast. Around Kwigillingok the Bering cisco winters offshore, probably in the tidal area near the mouth rivers (Morrow 1980). The Bering cisco around Hooper Bay not only winters in deeper tidal water, but apparently in some of the rivers as well.

Around Kwigillingok, it was noted by local fishermen that when the spawning run started in May, large schools of cisco appeared just off the beach area and were largely harvested there. They were occasionally taken once they entered the river system. The fishermen of Hooper Bay did not indicate such a dramatic spawning run of the cisco. Whitefish are present in the bay during the summer, and a spring concentration in the shallow areas was not noted.

In addition to Bering cisco, other whitefish species are found around Hooper Bay. These include least cisco (qassayaq, *Coregonus sardinella*), humpback whitefish (qaurtuq, *Coregonus pidschian*), and sheefish (ciiq, *Stenodus leucichthys nelma*). With the exception of the least cisco,

these fish are not commonly harvested during spring.

Plants

Despite a short growing season, and continuous permafrost, the tundra of the coastal Yukon-Kuskokwim Delta supports a wide variety of plants, many of which are edible, medicinal, or have other uses (Ager and Ager 1980). Like other resources, the availability of these plants varies by species and category. Most of the plant species collected grow within a few miles radius of the village, but some plant material used by the coastal villages, such as driftwood, are not readily available within proximity to the villages. The source of driftwood is the forested stretches of the Yukon and Kuskokwim Rivers, over a hundred miles from the coast.

The plants available to coastal villages differ in their phenology and areas of availability. Most of the plants collected are general tundra plants and are locally common; however their specific habitat sites will vary within the tundra around the villages. Some plants may only be found along beach areas on the banks of sloughs, others may grow in the shallow margins of ponds, and still others may be ubiquitous. Likewise, some plants are best if gathered at a certain stage of their development, while others may be edible throughout most of their lifespan.

As soon as the pond ice starts melting, exposing the margins, the annual gathering of edible "greens" begins. Starting with the picking of Pallas buttercup (kapuukaraat, *Ranunculus pallasii*) and finishing in the fall with the collecting of grasses and "mousefoods", roots or tubers collected by wild mice, the gathering of edible plants occurs throughout the ice free months with varying intensity. The peak periods of gathering

are usually the spring through early summer and again in the fall prior to freezeup. Gathering does take place in the summer, but on a more sporadic basis interspersed between more labor intensive activities such as salmon fishing and processing.

The availability of driftwood for the coastal villages under study depends primarily on the action of the spring breakup of ice in the upper, forested portions of the two great river systems. The amount of ice scouring in the spring will largely determine the amount of trees toppled into the river. The prevailing currents and wind conditions along the coast will influence the amount of deposition along the shores once the floating trees have exited the river system.

KWIGILLINGOK SPRING SUBSISTENCE ACTIVITIES

Seal Hunting

Location and Timing of Harvest

The shorefast ice in any given year may extend off the coast of Kwigillingok from one to several miles, since there are no geographic features such as a small bay or rocky promontory in the area to create flaws in the ice. Seal hunters must hunt in the open ocean off the ice edge and are thereby restricted in the conditions under which they can hunt. Hunters search for seals in an area stretching from just south of the village to the vicinity of the sandbar islands near Kipnuk (Fig. 8). Most hunting is currently concentrated in an area running from south of the village to 20 miles southwest and takes place just off the edge of the shorefast ice. It is now rare for hunters to travel as far as the islands near Kipnuk in the spring, although in the past when seal camps

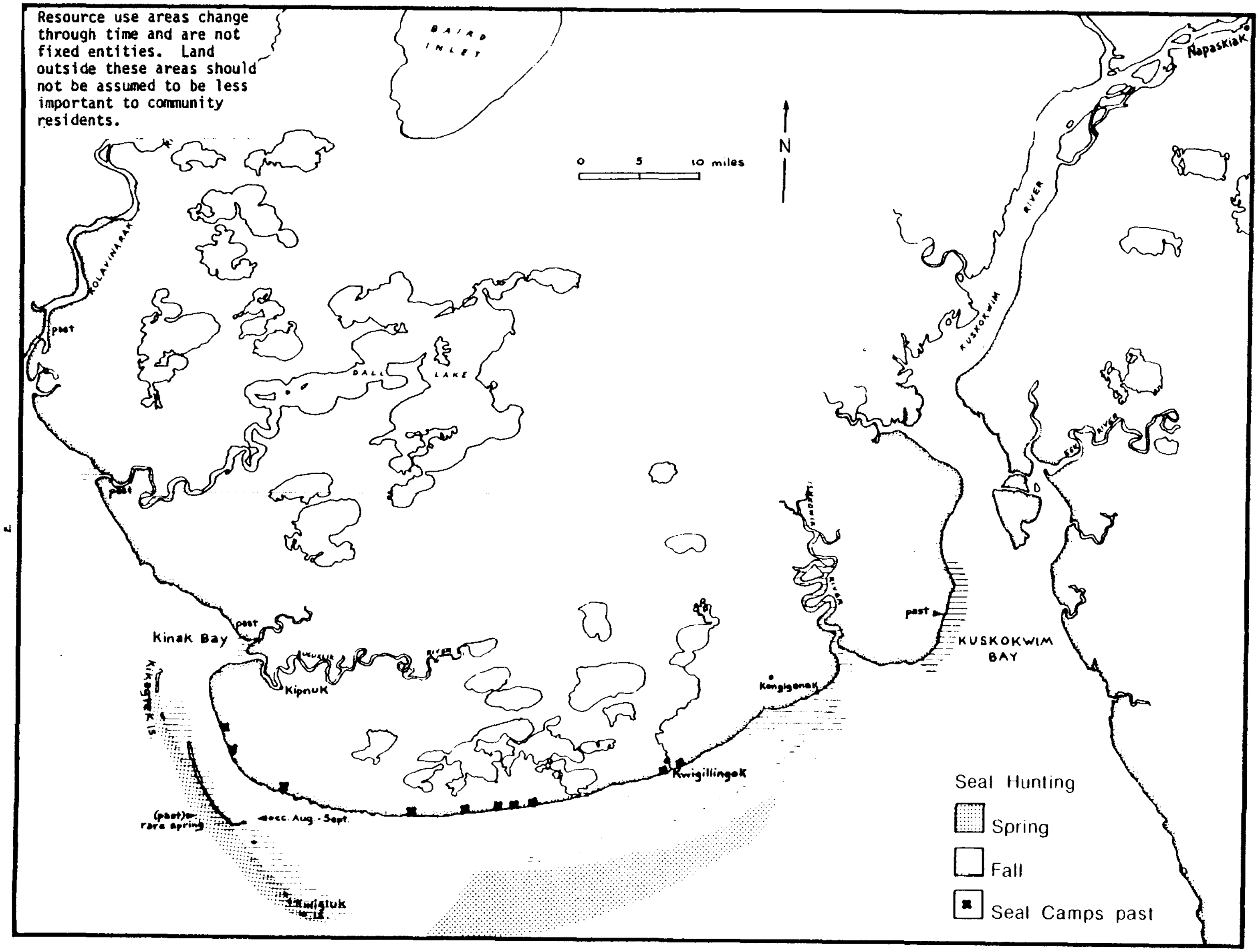


Fig. 8. Seal hunting areas of Kwigillingok residents, c. 1981-1983.

were still used these areas were more commonly used. Seal camps were usually located along the coast near submerged river mouths. The hunters would move to these camps before breakup and all seal hunting activities would emanate from these camps. The advent of snowmachines and the subsidence of land resulted in the abandonment of seal camps in the 1960s.

Seal hunting may start as early as late February when a few hunting parties start sporadically scouting the edge of the shorefast ice for seals. The activity intensifies through March reaching its peak in late-April. Seal hunting may continue through mid-May or until snow and ice conditions have deteriorated too much to permit safe travel. During the late breakups, snow travel may be feasible until late May, but this is not usual. The peak of hunting in late April is coincident with the most intensive period of pack ice disintegration and migratory movements of the seals. Some hunters noted that the higher concentration of seals during late April and early May was due in part to the seals moving in close to shore in anticipation of the arrival of herring, which usually migrate to the shallow coastal waters to spawn anytime from early May to early June.

Environmental Constraints

Kwigillingok seal hunters hunt in open seas using small, usually 16-foot aluminum skiffs. Their hunting activities are affected by prevailing weather conditions. They prefer to hunt when the weather is calm and the seas are not rough. In this context, seals are easier to spot and conditions are less hazardous for hunters.

According to informants, seal densities are usually influenced by the relationship of the drifting or pack ice to the shorefast ice. With

an onshore wind, pack ice will be close to shorefast ice, creating a lead in which the seals tend to concentrate. With an offshore wind, floating ice may move from a few to several miles away from the shorefast ice, dispersing the seals and forcing hunters to search in a much larger area.

During two days that the researcher observed seal hunting in April, the first day was calm, relatively warm (10 to 15 degree Fahrenheit) with winds from the northwest at less than 10 knots. The edge of the shorefast ice was estimated to be at least three miles from land. The floating ice was within 100 yards of the shorefast ice during the afternoon. Several seals were sighted and three of four boats observed were successful in landing at least one seal. The second day was cooler (5 to 10 degree Fahrenheit) with considerably more wind (20 to 25 knots) from the northeast, a low chill factor estimated at -25 degree Fahrenheit, and seas to two feet. The floating ice was over a mile from the shorefast ice and the water was choppy with a shell of new ice forming outward from the landfast ice. The hunters observed this day were all unsuccessful in securing seals. No seals were sighted by the hunters who the researcher accompanied, even when the hunting party was joined with another and both parties ventured to the distant floating ice in pursuit of seal. Even on days with marginal conditions for seal hunting, hunters often chose to hunt at least a portion of the day. Given the vagaries of environmental conditions and migratory patterns of seals, hunters cannot rely on the possibility of later, more favorable conditions for seal hunting. Hunting effort varies from year to year dependent on the variables of ice conditions, weather, and seal movements. Occasionally persistent, extensive ice conditions and/or hazardous weather patterns may reduce hunting effort to a minimum. In the past the failure to harvest seals due to ice

conditions resulted in starvation within both study communities.

Logistics and Techniques

The gear used by the seal hunters of Kwigillingok includes equipment specifically developed for marine mammal hunting and equipment of general applicability to many pursuits. The standard gear consists of small aluminum skiffs, 16 feet in length, fitted with outboard motors which range between 25 and 35 hp. Hunters equip themselves with rifles generally of .222 or .250 caliber. Other gear consists of oars, harpoons, gaff hooks, shotguns (for incidental waterfowl hunting), Coleman stove and kettles, thermos, canvas tarp, food or cooler, additional clothing, and sleeping bags. Other accessory gear essential to the seal hunting effort are snowmachines and sleds used to haul the hunters and their boats and equipment from the village out to the ice.

Two snowmachines with sleds are usually necessary for each crew to pull the full complement of gear. One sled is used to haul the boat and the other the rest of the gear. Boat sleds are low, long and flat with side rails similar to sledges. The other sled is usually box-like with high sides and contains the outboard motor, gas tanks and other gear. Both types of sleds are hand crafted of plywood and are used for other types of activities.

Most hunters haul their boats to and from the community each day. A few occasionally leave their boats on the shorefast ice, but at some distance from the edge. Most boats observed had the exterior paint either scraped off or a white covering paint applied in order to camouflage the boat for use in ice areas. Many hunters don a white canvas parka over their other winter clothing for additional camouflage. Harpoons are

made with 5-6 foot shafts crafted from driftwood. The projectile end of the shaft is reinforced with an ivory socketpiece into which a brass point is secured, also locally handcrafted with three barbs on one edge and two on the other. Through a hole at the base of the point is passed a headline which is bound securely to the woodshaft. The toggling point detaches from the socketpiece upon impaling a seal. Gaff hooks are used for bringing dead seals into the boat. These have wooden shafts 2 to 3 feet in length attached to a large metal hook (8 to 12 inches in length).

Hunting parties for spring seal hunting typically consist of crews numbering two to three men. Usually crew members are all from Kwigillingok, but sometimes relatives from the neighboring communities of Kipnuk and Kongiganak join seal crews. Women do not seal hunt in Kwigillingok. Typical configurations of crews include fathers, sons, and brothers. Other arrangements were possible such as a man and his wife's cross-cousin. The day the researcher participated in seal hunting, the known crews consisted of brothers, men hunting with relatives from Kongiganak, and an older man hunting with a young man of unknown relationship from an inland community. Riordan (1980) recognized that other temporary alliances between first cousins and uncles and nephews for the purposes of seal hunting might also exist. The older men in Kwigillingok tend to have partnerships that persist over time. Younger men are more flexible in their choice of seal hunting parties.

Seal hunting techniques were observed during two days at the end of April 1982, as noted earlier. Hunters will head out of the village, some before daybreak (5:00 a.m.), on those days when wind and weather conditions appear favorable (light, onshore wind). The hunters will travel the edge of the shore fast ice searching for swimming seals. Hunting is usually

an individual effort by boat, although when the floating ice is far offshore, two or more boats may join together to go out and look for seals among the distant floes. The boat may be driven upon the shore ice or a large floe while scanning the area.

When a seal is observed traveling close to the shore ice and appears unaware of the hunters, a hunter projects its route and then moves the boat ahead of the seal and up onto the shore ice to await the seal's resurfacing. The outboard motor is shut off so that the seal is less likely to be alerted to the hunter's presence. This also permits the hunter to have a more stable shooting position if the seal does come up within range, about 200 yards or less. Sometimes several relocations or repositionings of the boat are necessary to place the hunter within shooting range of where the seal will resurface.

When a seal is swimming far off the edge of the shorefast ice, an alternate method is used to pursue the animal. The hunter heads his boat out towards open water and attempts to guide the seal back towards the shore ice. Again, the hunter tries to determine where the seal will resurface, positions himself there and then reduces the boat engine to an idle. If the seal surfaces within range, one or all of the hunters will shoot. If they are unsuccessful they will repeat the procedure. The preferred target is the head as death is instantaneous, reducing loss and protecting the meat.

When a seal is killed, the hunters will move quickly to the kill site and use the gaff hook to secure the seal before it can sink. The harpoon is used when the seal is wounded and attempts to swim away. The line attached to the harpoon point and shaft prevents the seal from getting away while they hold the shaft, although another shot is fired to dispatch

the seal.

Seal hunting trips under favorable conditions lasts 10 to 14 hours. When conditions are not as favorable, trips vary in length depending on the hunters and the specific conditions. Some hunters only spend a few hours hunting on unfavorable days; others hunt all day as long as the conditions are safe.

A skilled seal hunter is able to assess the environmental conditions of the day in order to choose where he is most likely to encounter seals. He has a keen eye for sighting seals and experience in observing seal behavior in order to predict its movements. He has the patience to wait on the ice until the seal resurfaces and his shot is carefully placed. These attributes and skills are largely found in older men because of their years of experience, but younger hunters who have spent a lot of time seal hunting show considerable skills as well.

Disposition and Processing of the Harvest

Processing seals is mainly the responsibility of women. In some instances, a preliminary butchering and distribution takes place out on the ice, but generally these are functions performed by the women at the village.

At the end of a hunting day, the men return to the starting point and prepare the equipment for going home. The ringed and spotted seals are put intact into the sled, along with the outboard motor and other gear. If a bearded seal has been harvested, a preliminary butchering is done out on the ice. It is skinned and gutted, and those organs which will not be eaten or used are discarded. The carcass and skin are put together in one pile and the intestines in a separate pile for transport.

The carcass is wrapped in the skin, but the gut may or may not be placed in any container in the sled. Once the seals are back in the village women have the responsibility of processing and distribution.

There are at least three different methods of processing depending on village distribution customs, the type of seal, and the ultimate disposition of the by-products. The first seal harvested by every household is distributed village-wide regardless of species. For ringed and spotted seals, the skin with blubber attached is cut into strips approximately 2 inches wide and 6 to 9 inches long. The meat is cut into pieces also. The bearded seals are treated the same way, except that skin is not cut up, as it is sole source material for boot soles of the locally made skin boots. An announcement is made over CB radio that seal is available and those families desiring fresh seal send someone over with a container to receive a portion. Each household representative is given a strip of meat, blubber and if a ringed or spotted seal, hide. At this time, no particular cut of meat is considered preferential. Informants stated that this village wide distribution was done to satisfy peoples' desire for a taste of seal meat. The first seals distributed at the beginning of the hunting season meet with widespread response. Families who catch their first seal later in the season will still announce its a vailability for distribution, but the response will decrease as more and more families harvest their own seals.

The other two methods of processing apply to all the other seals taken which are not subject to village-wide distribution, but will be retained by the immediate household and shared within the extended family network. The skinning method differs depending on the ultimate disposition of the skin. Some households still use sealskin pokes as

storage containers for fish and seal oil. These are made using skins of ringed and spotted seals. Women skin out the seal making a cut only around the mouth, and work the skin free of the blubber and carcass from the head and neck, downward. The flippers are cut at the ankle and wrist joints. At a later time, the skin will be inverted, scraped further, and prepared to make a poke. For skins that are used as articles of clothing and other products, women make a long ventral cut and from the stomach area start freeing the carcass from the skin and blubber. In both cases, the blubber will be removed from skin or carcass (as in seals whose skins have been removed for pokes) for further processing. Skins of the smaller seal species (ringed and spotted) will usually be left with the hair on and nailed to an outside wall to dry before being used. The women usually slip the hair off the bearded seal skins prior to drying them. The women tan all the skins themselves, a process which involves considerable scraping and treating of the hide with a home tanning solution, such as soap and water. This phase of processing might take place several months later.

All the blubber removed during the skinning phase is further processed by being cut into small strips and chunks. Although a few pieces will be cooked to accompany dried foods, most is packed in a variety of containers to be rendered. Traditionally the blubber was put into seal pokes which were the intact inverted sealskins previously described. These blubber filled pokes were buried in the ground for both rendering and storage of the oil. Only a few women still render their oil this way, although many still store their rendered oil in pokes. Many women now render their oil in jars or barrels, which may be kept by the stove to speed the rendering process. The rendered oil is stored in a cool

place to prevent it from becoming rancid.

Some meat from the earliest harvested seals is eaten fresh; however, most seal meat from these and subsequent seals is either dried or frozen for later consumption. In the past, drying was the sole method of preserving spring seal meat, but with the availability and purchase of freezers, freezing is now a common method. Meat which is to to be frozen is cut into large pieces. Meat for drying is cut into thin strips and small pieces and hung on a rack outdoors or in a storage shed to air dry. Organs such as the heart, liver and kidneys are eaten fresh or occasionally frozen. Flippers are eaten after they have "aged" for a few days in a storage shed.

The intestines from bearded seals are used for several purposes. The outer lining is boiled and eaten. The inner lining of the upper intestine is scraped and often eaten by older village residents. The middle lining is soaked in water or urine for several days, rinsed, inflated, and tied outside in a long line to dry. After it is dried, it is split in half lengthwise and is used either for making waterproof parkas or dyed different colors to be used as decorations for grass baskets. A few women continue to make sealgut raincoats, a laborious and time-consuming process which requires particularly careful handling of the dried lining. Because they are waterproof, light, and tend to be warm when wet, many people still consider the sealgut raincoat superior to imported ones of synthetic materials.

The women of some households celebrate the first seal harvested by sons or husband by giving a "seal party" (uqiquq, "to furnish continuually with seal oil" (or blubber); Mary Pete, per. comm. 1982). This involves the hostess inviting all the women of the village to gather outside her

house and from a makeshift platform she will toss gifts to the assembled women. Today these gifts include seal meat and blubber as well as store-bought gifts such as pieces of cloth, cookware, household items, and candy. In the past the gifts were seal meat and by-products and pieces of cloth (cf., Fienup-Riordan 1983 for a description of seal ceremonies on Nelson Island). Many women choose not to hold "seal parties", but will still distribute their seal meat and seal products to the village in the manner described previously.

The products derived from the hunting of seals are many, providing both food and goods. The skins of the ringed and spotted seals are commonly used to make parkas and the uppers on skinboots. If the hair is removed on these skins before they are dried and tanned, they can be used to make the uppers of waterproof boots. The hair on the skins of bearded seals are always "slipped" before drying. Historically, these tough skins of the adult bearded seals were used to make kayak covers. Today some women use them as a type of "ground cloth" to work on during the summer while they are cutting fish.

The skins of the young bearded seals (amirkat) are prized, as they are the source of material for soles of skin boots. The skins of the amirkat are thicker and tougher than those of the ringed and spotted seals, but are more pliable than those of adult bearded seals.

As noted before, the meat of seals, certain organs, and flippers are eaten, either as a fresh, dried, frozen or aged product. The blubber is rendered as seal oil, providing a good source of fat and vitamin A (Heller 1964). As a condiment for dried or frozen food, it acts as a softener and an aid to digestion. People also enjoy the taste of seal oil and use it as a flavoring agent in soups and akutaq ("Eskimo ice-

cream"), as well as a preservative for dried fish stored in pokes or other containers.

Because of the food and materials that spring seals contribute, they comprise a significant resource in the local subsistence economy. Their timing in the annual round is also significant. The late winter sees the dwindling of household stores and was historically the time when starvation periods might occur (Drebert 1956). It is also the period when most people are eating a consistent diet of dried and frozen meat and fish. There are few sources of fresh meat during this time. Some households purchase limited quantities of imported foods to provide variety in their diet. However, the expense of such foods precludes them from being anything other than short-term substitutes for fresh wild foods.

The migration of seals, although in itself subject to many variables, is a source of great anticipation for the village. The fresh meat relieves the monotony of the winter's diet, replenishes dwindling food stores, and supplies other nutrients. The bulk of other commodities such as seal oil and skins comes from the seals that are harvested during this period. Spring seal hunting also reaffirms the ties between hunting partners and between individual families and the village through sharing. Thus, even though the gross poundage of meat and by-products contributed to the household economy by harvested seals may be less than that derived from other sources, their critical timing in the annual cycle and their intrinsic value to the economy and society as a whole make seals one of the most important and valued resources to the subsistence economy of Kwigillingok.

Walrus Hunting

Location and Timing of Harvest

Walrus are hunted at the same time as spring seal hunting. They are usually found drifting northward on floes of the eroding pack ice during the end of April through the middle of May, depending on winter conditions

Environmental Constraints

The walrus harvest in the spring takes place in a more limited time frame than that of seal hunting. The walrus migration occurs late in the spring around early May and is more concentrated. Walruses tend to be more gregarious than the three seal species that frequent this area of the coast. The herd travels northward together in small groups on the ice floes but within close proximity in time and space. Although hunters may unexpectedly encounter walruses before or after this migratory period, planned hunting trips are made during the short time of peak migration. A portion of the walrus herd that winter near or south of Kuskokwim Bay migrates northward through Etolin Strait. Residents of Nunivak Island near the Strait are able to harvest greater numbers of walrus. Below Etolin Strait the ice floes are generally widely dispersed and hunters of Kwigillingok usually only have access to the animals traveling on the periphery of the herd and not within the core of the herd. Because this is a peripheral migratory route the number of walruses encountered varies from year to year but walruses are usually available for harvest each year.

Logistics and Techniques

Since walruses are normally encountered while seal hunting, the gear used is similar to that used in seal hunting described earlier. Some men prefer to use higher caliber rifles, but it was reported that the .222 - .250 caliber rifles that are commonly used for seal hunting can kill walrus as long as the shot is made at close range and hits the walrus in the right place.

Crew composition for walrus hunters is also the same as that described for seal hunting. Some people noted that in the spring, it was mainly younger men who actively sought walrus which were passing through the area. Older hunters will take walrus if they encounter them when they are seal hunting, but they are not as likely to actively seek them during this time. Often more than one boat of hunters will team up to hunt walrus if they have been spotted, although men in a single boat will harvest them as well.

Generally, hunters seek walrus that are resting on ice floes. Adult walrus may weigh up to 3500 pounds, too much weight for a boat with a crew of two to three men to pull up on ice unassisted. Swimming walrus are therefore usually not shot at as they are more easily lost. It is preferred to take walrus that are on ice floes that are large enough to support the boat during butchering. Sleeping walrus are approached quietly by boat. Usually if there are more than one walrus on a floe, a walrus near the center of the floe will be selected to be shot. These animals are less likely to fall off the floe if they are killed outright and may not fall off if they are severely wounded. Once an animal is dead on the ice, the boat(s) will pull up on the ice and initial butchering of the

animal takes place.

Disposition of Harvest

If the hunting party has only one boat the carcass is gutted, and most of the meat, organs, hide, and flippers are put into the boat. If men in more than one boat assisted in the harvest, the carcass is divided among each group involved. The hunter who actually fired the shot retains the head and other prize parts such as the heart, liver and kidneys although he may also share portions of these with his partners. Additionally, he may keep any clams found in the walrus' stomach. The meat and hide are divided among all the participants.

After the walrus has been initially butchered in the field, a share of the walrus is taken in each boat. The women in the households of participating hunters are responsible for further processing and distribution of the meat. Because these animals are not common, all walrus are subject to a village-wide distribution. Large portions of meat, blubber, and hide is distributed to each family that wants some. Organs are shared with the hunters' relatives. In this way the whole village benefits from the harvest of walrus, whether it is a single animal or several.

Walrus meat is eaten fresh or dried. The hide is eaten after it is boiled or added to soups or eaten raw after it has been aged. The liver and heart are usually eaten fried, while kidneys are eaten raw. The blubber is rendered for oil and the intestines are processed similar to sealgut.

Waterfowl Hunting and Egg Gathering

Location and Timing of Harvest

As described earlier, two groups of waterfowl are present along the Yukon-Kuskokwim coast during two different seasons. This influences timing and locations of hunting and egging. As eiders winter along the leading edge of the pack ice, they usually can be found near the shorefast ice around Kwigillingok by January or February, depending on the ice conditions of any given year. In a normal year the edge of the shorefast ice may be five to seven miles or more out from land. These are predominantly common eiders; king eiders tend to move into the area in force when the ice starts receding during break up of the ocean ice. There is an occasional harvest of eiders that takes place during the late winter months. However the intensity of hunting activity picks up during break-up about late April when seal hunters encounter large flocks of eiders as they search the edge of the shorefast ice and floating ice for seals.

As break-up progresses and the ice recedes, eiders intensify their migration northward and are replaced by summer migrant waterfowl. Brants and emperor geese are among the first species to arrive and are encountered closer to the beach than the eiders. The initial harvest of summer migrant waterfowl occurs on the water along the coast, but shifts inland as the snow melts and the birds move ashore to their nesting areas (Fig. 9). Thereafter hunting activity can take place anywhere from the Ishkowik River to over 30 miles west of Kwigillingok. Most hunting occurs in a band a few miles wide extending inland from the beach along the coast. Other harvest areas are several miles inland along the myriad sloughs and lakes that lace this section of the coastal plain.

The gathering of eggs occurs anywhere along the coastal plain from 30 miles west of the village to the Ishkowik River and several miles inland. A nearby small gull colony was cited as an especially good area for eggs. Much of the egg gathering takes place along the beach near the village (Fig. 9).

Egg gathering principally takes place in May, although egg gathering is sometimes delayed until the end of the month because the persistence of snow delays the onset of nesting. Usually if the tundra is relatively snow-free by the first part of May, nesting begins by the middle of May. Since the incubation period of most of the birds (waterfowl, shorebird, gulls, and terns) is less than a month, egg gathering usually ends by the middle of June.

Environmental Constraints

Eider hunting takes place along the edge of the shorefast ice during seal hunting and as such and is subject to the same weather and sea conditions that influence that activity. Eider flocks may be found close to the shorefast ice, but occasionally they may be far out with the drifting pack ice. The common eiders may be present near the shorefast ice as early as February, but as the ice pack starts to break up and retreat, large flocks of common eiders, followed by the king eiders, move through the vicinity of Kwigillingok as they migrate north. As they depart, the migrations of the other waterfowl species move into the area. According to local hunters, Kwigillingok's geographical location is east of a main migratory route that extends north along the coast west of Kipnuk, shifting onshore somewhere near Nelson Island. The birds that are found near Kwigillingok are part of a smaller migrating group. The

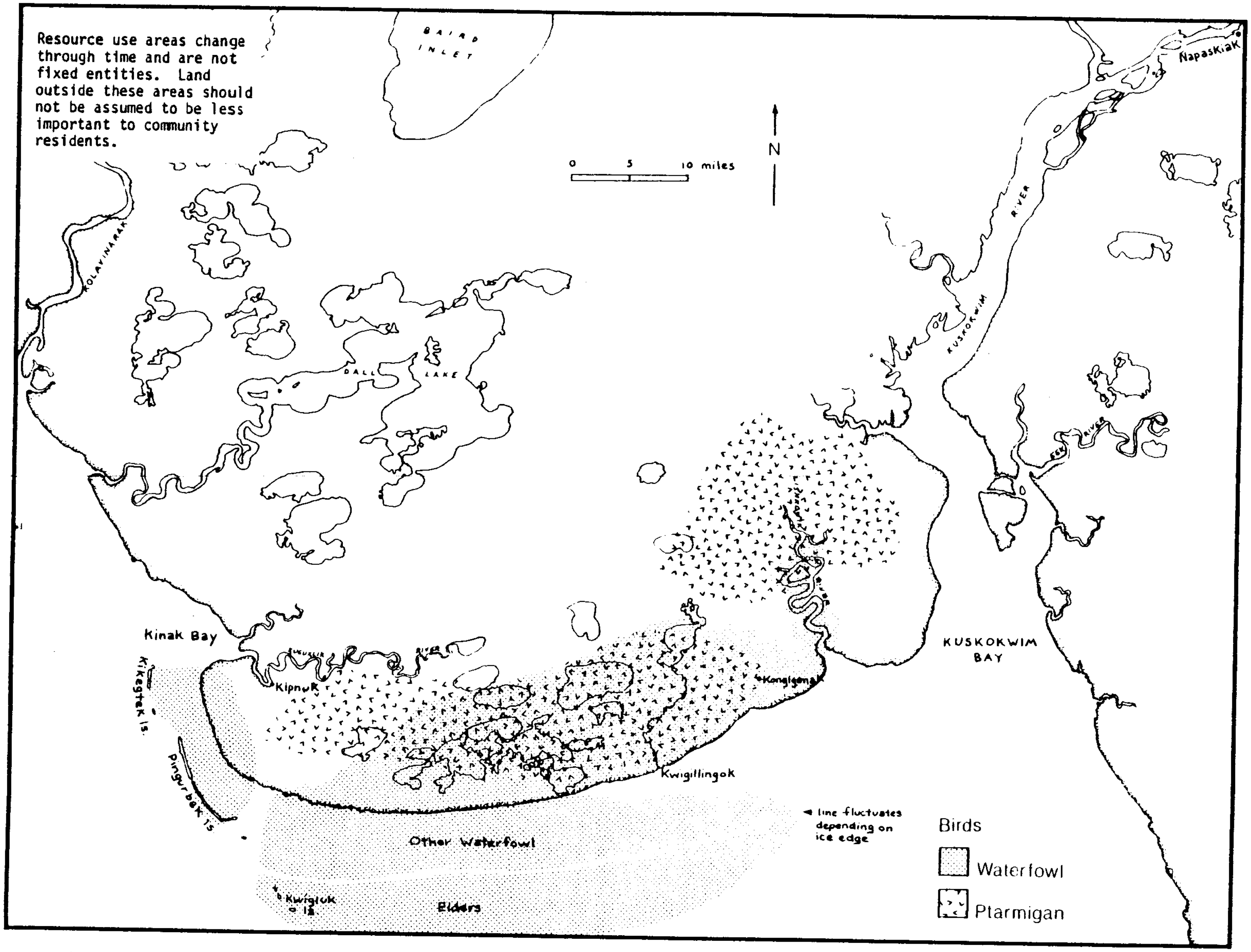


Fig. 9. Bird hunting areas of Kwigillingok residents, c. 1981-1983.

coastal plain around the village is not as productive an area for nesting waterfowl as are areas farther north around Nelson Island and Hooper Bay (Byrd 1982). Therefore the density of nesting birds, especially geese, is less in this area than further north in areas such as near Hooper Bay.

The density of nesting birds around Kwigillingok affects the types and amounts of eggs available to the residents. Since the density of nesting waterfowl, especially geese, is lower here than in the area around Hooper Bay, waterfowl eggs are not as numerous. Gull and tern eggs make up the bulk of the eggs collected although other types of eggs are collected as well. The nesting success of waterfowl affects the availability of down, since these birds use their own down to line nests (Terres 1982). However, most Kwigillingok residents do not actively collect down from abandoned nests.

The general weather conditions which influence other subsistence activities at this time will also affect the hunting of waterfowl and the collection of eggs. Weather that is considered generally poor (rainy, windy, and/or stormy) curtails most gathering activities and often hunting as well.

Logistics and Techniques

Eider and summer migrant waterfowl are harvested with shotguns, usually 12 gauge. Boats are usually used as transportation, although snowmachines also are used if snow conditions allow.

Hunting group composition for waterfowl varies. Hunting that is done concurrently with seal hunting is conducted by seal hunting crews. After seal hunting is over, waterfowl hunting is usually done by members

of the same family or close kin. Young men often hunt with friends. Hunting is often done by the younger men in a family. Elder heads of household may not participate on a regular basis even if they are still physically active. Men hunt individually or in small groups. Individual households harvest their own waterfowl although there is sharing among the family unit which extends beyond a single household.

The hunting of eiders is done primarily in conjunction with seal hunting. If these flocks are nearby or fly within range over the boats, they are shot at. Initial hunting of the summer migrants also takes place at sea as they first move into the area, briefly overlapping with the eiders. As they move ashore, they may be hunted on land by snowmachine until the snow has deteriorated enough to make travel unfeasible. As soon as the waterways are free of ice, hunters will again hunt waterfowl by boat, often camping for one or more days. At this point bird hunting is a major focus of these trips, with other gathering activities such as collecting edible greens conducted concurrently.

Very little gear is required for gathering of eggs or greens. Some sort of containers such as a woven grass bag (issran), back pack, pail, or bucket will be used to hold the gathered eggs. People may choose to go either by foot or by boat. All other gear such as camping equipment is incidental, although short camping trips are commonly made to pursue gathering activities.

The principal participants in egg gathering are women of all ages and children. Men provide logistic support and occasionally help gather during initial collecting or camping trips. The gathering of eggs and greens represents the first seasonal opportunity for young children to participate in subsistence harvest activities. Their initial efforts

garner them praise.

Some families celebrate the first gathering efforts with an uqiquq or "throwing away" party, given by a mother or grandmother, similar to the parties that are given in early spring to commemorate a family's first seal harvest. Gatherers go out individually or in small groups. Groups commonly include mother-daughter, sisters, and aunt-niece configurations.

Gathering occurs on days with fair weather. If there are no conflicts with other activities, women head out for a whole day or just a few hours either by foot or by boat. At the beginning of the gathering season, people may choose to go out on short camping trips which may last overnight to a few days. Other activities such as hunting and fishing often occur during these trips. Egg gathering varies in intensity. At the beginning of egg season frequent trips may be made to gather eggs. As the season progresses, people will go out to collect eggs on an as-needed or desired basis and gathering will be interspersed with other activities.

Disposition of Harvest

Eiders are eaten fresh, but those households with freezers may freeze them for later use, especially if a sizeable amount is harvested. Some people dry eiders. Eiders are skinned totally including the head, gutted, and cut up to be boiled for soup.

Summer migrant waterfowl are either eaten fresh or frozen for later use. In the past these birds were plucked, dried and salted in barrels or left unplucked and hung with salt. When prepared for eating, waterfowl are plucked, not skinned. If used for soups, all parts of the carcass are used including the head and feet. Many of the birds are preferred "half-cooked" or boiled to a medium rare consistency. Some types of

birds are considered good both boiled and baked. Seasonal preferences for waterfowl were expressed by a few residents. It was stated that while white-fronted geese are good both in spring and fall, cranes taste best in the spring and Canada geese are considered best if harvested in the fall. While a wide diversity of waterfowl are harvested, taste preferences mean that some hunters may target on certain species during certain seasons.

Waterfowl are a highly preferred food resource for the people of Kwigillingok. While they do not contribute a large bulk of food to the family food supply, they are considered delicious and their short-term availability have always made them a prized resource. Along with seals, they are an early source of fresh meat. Historically, the arrival of these birds prevented widespread starvation in coastal communities during those years when seals failed to show up in appreciable numbers (Sullivan 1918). Because the local area does not support the dense nesting colonies such as are found at Kokechik Bay and the Kashunak River near Hooper Bay, the hunters of Kwigillingok are more dependent on deriving the bulk of their waterfowl harvests during the migratory periods.

Eggs are usually retained by the gathering household. It is not uncommon, however, for families to share with other households that were unable to gather any for themselves. Eggs are retained for only short periods of time, although some people preserve eggs by freezing them raw or putting hardboiled eggs in pokes underground. For immediate use, eggs are kept in a cool entryway often in a large bucket with water. Enough eggs for one or two days are removed at any one time. Eggs are usually hard boiled and served as an accompaniment to meals or as a snack. They are considered a delicacy and are eaten often with tea or coffee at the

end of a meal, similar to a dessert.

A wide variety of eggs are eaten, although seagull and tern eggs predominate. It was stated that the only eggs which local people would not gather were swallow and scoter eggs. Because local eggs are only available for a short time and are difficult to preserve for long time periods, they are eagerly pursued while present. Even though the local stores now carry chicken eggs throughout much of the year, they are not considered the delicacy that the local wild eggs are, and are not considered a substitute for wild eggs.

Beaver Hunting

For the residents of Kwigillingok as well as other villages along the coast of the Yukon-Kuskokwim Delta, beavers are recent immigrants to the largely treeless coastal plain. They have been present in the local area only within the past two decades. Residents of Kwigillingok have incorporated harvest of this recent resource into their annual cycle. Beavers are usually harvested during the spring, although some animals will be harvested as they are encountered during the rest of the year. Some people employ snares under the ice, but the common method to harvest beaver is to use small caliber rifles immediately after break-up when the animals tend to disperse. Beavers are skinned and the pelts fleshed, stretched out round, and dried. The meat is eaten. The pelts are rarely sold, especially if the market price is low as was the case during this study period. Most pelts are used in the construction of garments such as hats and mittens and for trim on parkas and skin boots.

Muskrat Hunting

Muskrats, while present in the coastal plain around Kwigillingok,

constitute only a minor part of the village resource inventory. In the past, they assumed greater importance, but at present only a few people harvest these animals. Occasionally they are hunted by young boys.

Muskrats are primarily harvested for food during break-up when the animals are dispersing. Muskrat pelts are sometimes used for parka lining; they are more rarely sold. Possibly because the harvest of these animals conflicts with the more significant seal and waterfowl hunting, only a limited harvest of these small furbearers occurs each year.

Herring Fishing

Herring are a fairly recent addition to the local resource base. Prior to mid-1960s, residents noted that herring were not present in the vicinity of Kwigillingok. To fish for herring people had to go either to Kipnuk or further north to Nelson Island or they would trade with relatives from Nelson Island for dried herring. Most people believe that the herring which occur near the mouth of the Kwigillingok River are part of the Nelson Island stocks, a portion of which are moving southward. The herring that occur near Kwigillingok do not spawn. Some spawning takes place near Kipnuk, but most people asserted that the majority of spawning occurs around Nelson Island. As further evidence that the herring seem to be moving south along the coast, a few people noted that within the past few years herring have appeared along the shore near Kongiganak, east of Kwigillingok. Herring also were not present in that area previously.

Location and Timing of Harvest

Herring fishing takes place within a very limited area. Most herring

fishermen from Kwigillingok drift for herring right at the mouth of the local river or above the surrounding tidal bars on either side of the river at high tide (Fig. 10). It is also possible to fish for herring above the submerged river mouths that run alongside either end of Pingurbek sand island, although this area is less commonly used because it is further from Kwigillingok.

Some residents travel to the areas near Kipnuk to the west or further north to Nelson Island to harvest herring spawn-on-kelp. People who desire this resource usually obtain it from relatives in these areas either through exchange or distribution network, rather than procuring it themselves.

Depending on climatic conditions and the persistence of ice, herring fishing takes place from mid-May to early June. Once herring arrive, they may be present in the area for over a week, however most of the harvest takes place within a few days after their arrival.

Environmental Constraints

Herring will only move ashore once the coastal waters reach 37.4 to 54 degrees Fahrenheit (Hart 1973). The relatively straight coastline around Kwigillingok is not very susceptible to conditions of wind-impounded ice which would prohibit travel. Because of this the local fishermen run fewer risks of being unable to fish for herring than further north in Hooper Bay. Herring are present for a short period of time. Bad weather which causes rough sea conditions affects the harvest of herring by restricting fishing activity. Because of the shallowness of the Kwigillingok River and associated sloughs, access to herring grounds must occur at high tides. It is nearly impossible to get boats out to the mouth of

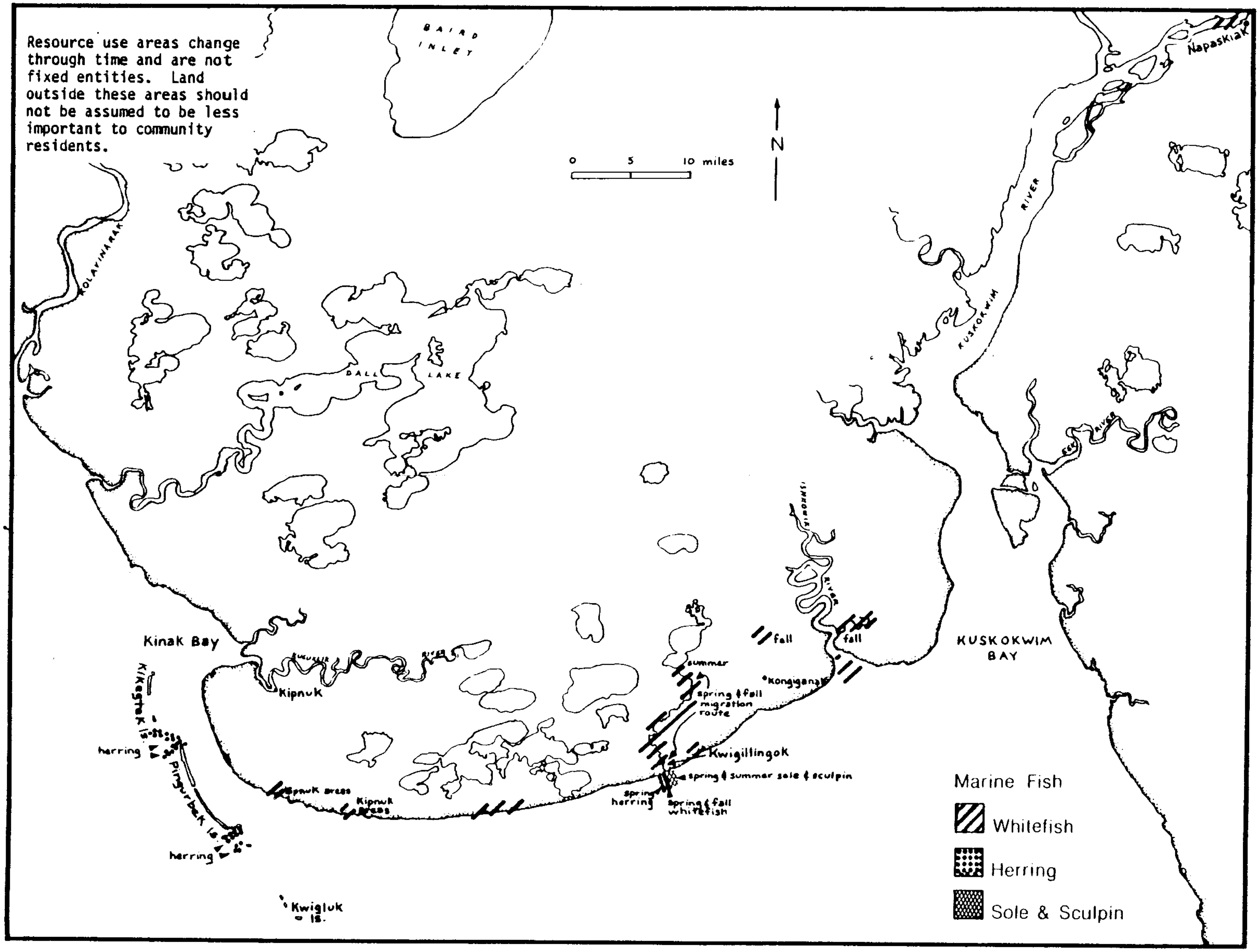


Fig. 10. Marine fish areas of Kwigillingok residents, c. 1981-1983.

the river at low tide.

The most important environmental factor influencing the harvest of herring by Kwigillingok are the movement patterns of fish themselves. As noted above, their availability is relatively recent and their distribution is slowing expanding into Kuskokwim Bay.

Logistics and Techniques

The major gear used for herring fishing is a short net about 40 to 60 feet in length with about 2 inch mesh and either small aluminum skiffs or the larger wooden skiffs, averaging 20 feet in length. Herring nets are generally used as drift net and occasionally as set nets.

Generally, fishermen make one or more drifts for herring within the Kwigillingok River channel or in the tidal area adjacent to the river. Some fishermen drift the net while the tide is going out and set the net while the tide is high. Occasionally if the fish are schooling heavily, the net can become so heavy that it drags in the tidal mud. At the end of fishing, the fishermen will go out to deeper water and put the net out again in order to wash it before heading home. Fishermen generally fish over a period of a few days. Some are able to harvest what they need during one day's fishing.

Herring fishing is usually done by men although occasionally younger women accompany their husbands. Typical configurations include father-son, brothers, and uncle-nephew combinations. Elder heads of household may participate if they are physically able, but often if they have sons or grandsons old enough to handle the boat and already experienced in herring fishing, they will delegate this activity to them. Not every household will fish for herring. One boat usually harvests enough her-

ring for two or more households belonging to the same family.

Disposition of Harvest

Herring fishermen are capable of harvesting many more fish than they generally do. Harvest is limited by how much fish women in a fisherman's family can process without waste, according to residents. Herring are processed by one or more female kinsmen, from the same or related households. Households with one woman are not able to process as much herring as larger production teams, so women from separate household units of a family group commonly work together, and the processed herring is divided among the representative household units. Younger women living in separate households commonly cut herring with their mothers.

Herring are usually brought out of the boat by the men of the household and will be placed in tubs or on cardboard or tarps, and covered to set for a day. Women noted that this practice tended to harden the fish and made them easier to cut. The women will cut the fish the next day no matter the conditions. Homemade, temporary wind and rain screens will be erected to shelter the women during rainy days if there is no storage shed large enough to house the activity. Herring are cut with uluaqs along the back on one side and then laid out flat. The guts are removed and put into a refuse bucket. Skeins of roe are placed in another container and eggs are dried for later use. Women do not save the roe skeins of herring that have large worm infestations or those skeins that are severely damaged. It usually requires an entire day to cut the herring, after which they are washed. Some women lay the fish out horizontally on any available surface for a day to further harden the fish and facilitate the drying process before braiding the fish to dry. Other

women skip this second air drying, preferring to braid the fish after they have had the evening to rest. The fish are braided into long grass ropes at least six feet in length with the grass plaited behind the gills. During fish cutting, women cut the ithmus of the gill underneath the mouth to facilitate the braiding process. The ropes are draped over a drying rack and the ends tied. Each day the ropes are rotated so that each portion of the rope aerates equally. The fish are hung until most of the fish are totally dried. Some of the larger fish may still retain some oil and these oily fish are put into pokes to further preserve them. The rest of the fish are left on the ropes and packed in cardboard boxes and put away in storage sheds.

Whitefish Fishing

Location and Timing of Harvest

Most of the harvest of Bering cisco (imarrpinraq, Coregonus laurettae) takes place at the mouth of Kwigillingok River and the adjourning tidal areas (Fig. 10). Some of the harvest takes place at the mouths of nearby sloughs, especially those that drain the Bow Lake area west of the village. The whitefish move upstream as spring progresses. There is some limited harvest of whitefish during the summer at the outlet of the lake, but this activity has fewer participants than the spring harvest.

The ciscos move inshore usually before the arrival of herring. While herring move inshore for a restricted time period and then depart, ciscos remain within the local waterways throughout the summer, although the peaks of harvest coincide with their spring and fall migrations.

Environmental Constraints

The myriad of rivers and sloughs draining this part of the coastal plain are shorter in length and more shallow than many of the water systems found around the Hooper Bay area. It is not uncommon for these streams to freeze solidly during some winters. The Bering cisco stocks around Kwigillingok therefore must move offshore during the winter and are thus unavailable for harvest during this period. This is unlike Hooper Bay where portions of the local population will be present in some of the larger water systems throughout much of the winter months. Because of the restricted time of availability, there is more emphasis in Kwigillingok on harvesting the spring migration. These fish tend to school around the mouth of the rivers and the tidal areas before ascending the rivers.

Both the weather and tides affect the harvest of whitefish. Fishermen will not go out in stormy weather, although they will commonly fish in inclement weather when the sea is not rough. The shallowness of the local sloughs and river as well as the nearshore tidal area also influences the timing of harvest, because of reduced access at low tide.

Logistics and Techniques

The harvest of whitefish is undertaken in skiffs with nets. Either 16-foot aluminum skiffs or the larger wooden ones are used. Nets average around 60 feet in length with 3-inch mesh.

Whitefish fishing may be conducted by members of nuclear or extended families. Physically active heads of household will undertake this activity if they so desire or if they have no adult son available to fish.

Father-son, brothers and uncle-nephew work groups are all common, although men may also fish individually or with other kin.

There are at least two different methods of fishing for whitefish during the spring. One method is to set the net across the outlet of a small slough for a few hours, then remove and pick the net. This method allows the fishermen to pursue other activities such as gathering or hunting while the net is set. The other method is to drift with the net while the tide is high or going out similar to herring. Other fish that may be caught at the same time include sculpin and yellow-fin sole.

Disposition of Harvest

Spring whitefish may be eaten fresh or dried for later use. They are gutted and then braided similar to herring in long grass ropes to dry. After they are dried, many may be put in seal pokes with oil for the winter.

Spring whitefish are especially important for village residents, because they were the only fish present in the spring in large numbers prior to the advent of herring. Although herring have now become an important resource during the spring, many families still harvest large amounts of whitefish as well.

Edible Plant Gathering

Location and Timing of Harvest

The gathering of edible plants takes place all along the Kwigillingok River and within a few miles radius of the village (Fig. 11). This area represents the area of potential search for edible greens in general.

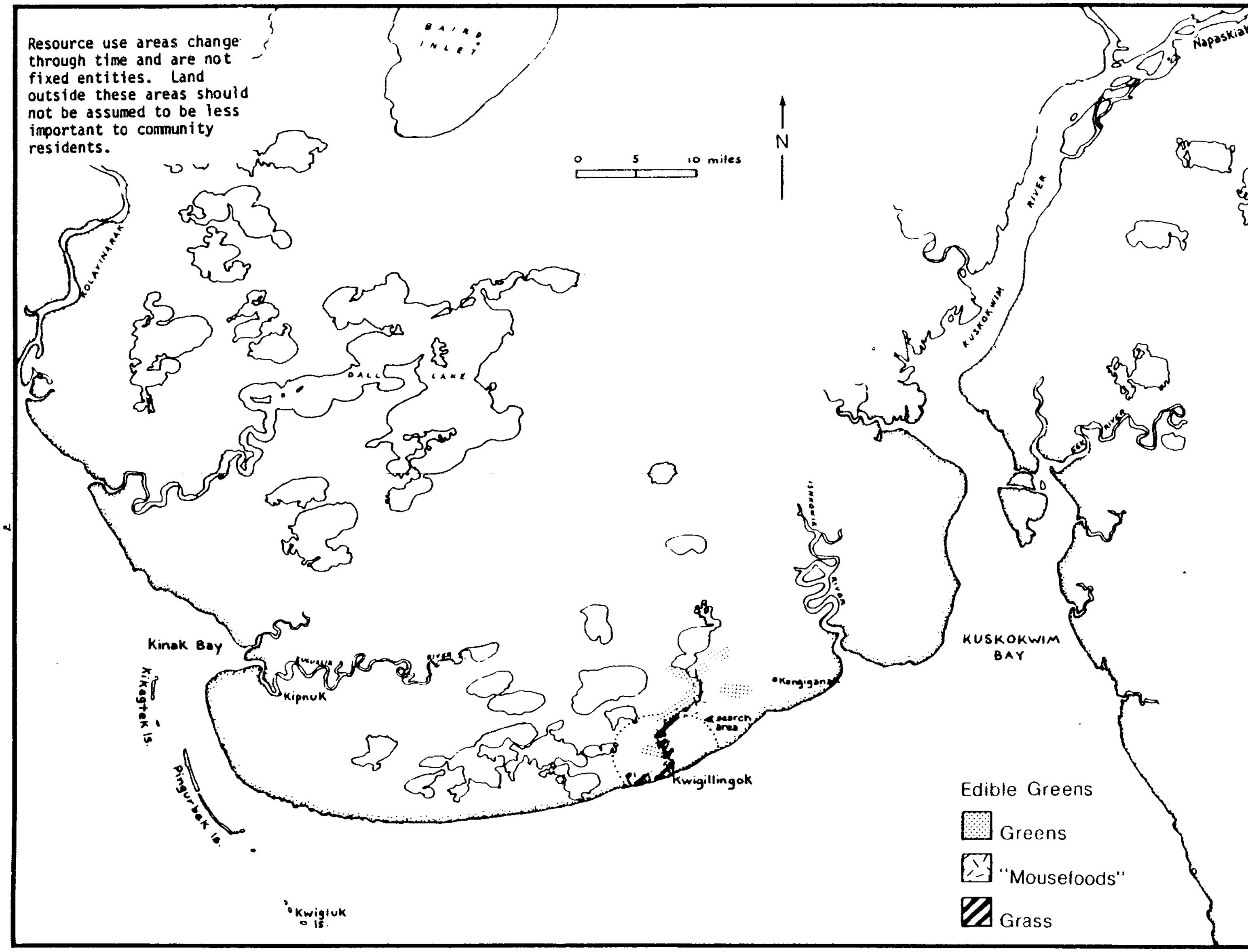


Fig. 11. Plant gathering areas of Kwigillingok residents, c. 1981-1983.

Each type of plant may occupy specific habitat zones within the area. Pallas buttercup (kapuukaraat, Ranunculus pallasii), goose grass (tayarut, Hippuris vulgaris), and cowslip (allngiguaq, Caltha palustris) occur in the fringes of ponds. Other plants such as sourdock (qaugciq, Rumex arcticus, "wild spinach"), two species of "wild celery" (kaagpak, Senecio congesta L.) and (ikiituk, Angelica lucida), occur on the tundra itself, but again may occupy discreet units of habitat such as marshy, low areas or the various sized mounds that dot the coastal plain.

Almost as soon as the margins of ponds are free of ice, usually sometime in April, the Pallas buttercup or kapuukaraat can be gathered. It is preferable to gather the young shoots of this plant before it starts developing flowers, as it starts tasting bitter after this point. One type of wild celery (ikiituk, Angelica lucida) is available by the end of May, but becomes bitter by the end of June. Some plants are good to pick throughout their life cycle, but others are best if picked before a certain stage. May and June are the peak periods of plant gathering. The gathering of greens may be done as a distinct activity or done in conjunction with other activities such as egg gathering, hunting and fishing. Gathering becomes more sporadic during the summer as other labor intensive activities such as salmon fishing occur. A more detailed listing of plants used by Kwigillingok residents is given in the Appendix C.

Environmental Constraints

Inclement weather may postpone or delay gathering activities, but gathering may occur under conditions that may be less than suitable for other activities. Thus, gatherers spend from a few hours to more than a

day collecting wild plant foods. If the sea is rough, people can either travel on foot or go by boat up the river which has protected waters.

Residents have a large body of knowledge about the local plants which has been handed down through the years. Older women are particularly knowledgeable about areas to pick specific greens and when it is best to pick them. Younger women possess knowledge of the most commonly used and sought-after plants such as Pallas buttercup (kapuukaraat), sourdock (qaugciq,) and cowslip (allngiguag). Children often accompany women when they gather plants, learning how to look for them and when they are best.

The advent of stores has meant the availability of limited canned vegetables throughout the year. However, these vegetables are not considered comparable to the local greens and are at best a substitute during the months when these greens are not available.

Logistics and Techniques

The gathering of greens parallels that of egg gathering and usually includes the same participants. To gather kapuukaraat, women will either walk or go by snowmachine to any shallow pond or lake where the ice has already melted and the young shoots have already started to emerge. Later after most of the snow and ice has melted, these plants are gathered before they flower from the margins of any pond where they occur. The other plants may be gathered as soon as they emerge, either on foot from the village or by traveling by boat up the river or on nearby sloughs.

Disposition of harvest

Prior to freezers, most plant material was too fragile to be retained

for long period of time although some could be stored in underground pits or frozen. Generally, greens were gathered for immediate consumption during the ice-free months. Currently, even though many households have freezers, most plants are still picked for immediate consumption over a period of one to a few days, as many plants do not preserve very well when frozen.

Most persons pick greens for consumption in their own households, although some sharing occurs with relatives who are unable to gather greens for themselves. Some greens such as kapuukaraat and "goose grass" are added to soups. Wild spinach and other plants may be boiled and eaten as a vegetable or mixed with berries and sugar to make a type of akutaq. Other plants such as wild celery may be eaten raw.

Most households in Kwigillingok gather at least a few types of wild plants for food and some gather a wide diversity of plants. Gathering greens represents one of the first opportunities for women and children to spend prolonged time out of doors after the cold winter months. Moreover, during gathering activities, children acquire knowledge of local resources, start learning to become producers, and begin contributing to their family's food supply. The gathering of greens may not be as visible as other activities such as seal hunting or salmon fishing, but it is considered an important part of the local economy, contributing a diversity of foods to the family's food supply.

HOOPER BAY SPRING SUBSISTENCE ACTIVITIES

Seal Hunting

Location and Timing of Harvest

The onset of spring seal hunting in Hooper Bay varies depending on each year's climatic conditions, but usually by the second week in April most men have started seal hunting. Seal hunting continues into May and until most of the shorefast ice is gone. Men then start fishing for herring and pursuing other resources. Although seal hunting occurs to a lesser degree in winter, there are a couple of factors that distinguish spring from winter seal hunting (described in Chapter 7). The most obvious is a difference in gear type. Spring seal hunters utilize aluminum skiffs, while the majority of winter seal hunting is undertaken in kayaks (qayaq) which fewer hunters own. Spring is probably the most active period of the year for seal hunting, with 30 to 50 hunting parties participating on any given day when conditions are appropriate. Spring seal hunting coincides with the period of most intensive seal migrations, when the greatest number and diversity of seals are encountered.

During the spring, hunting activity ranges from the mouth of the Kashunuk River to Cape Romanzof. Most hunting occurs from Hooper Bay to Kokechik Bay (Fig. 12). Hunting takes place off the edge of the shorefast ice. Depending on the location of floating ice, hunters may range far offshore sometimes up to 30 to 40 miles in search of seals. Several hunters noted that during these times, they lose sight of most land, their only guide on clear days being the highest peak of the Askinuk Mountains (2,342 feet) to guide them.

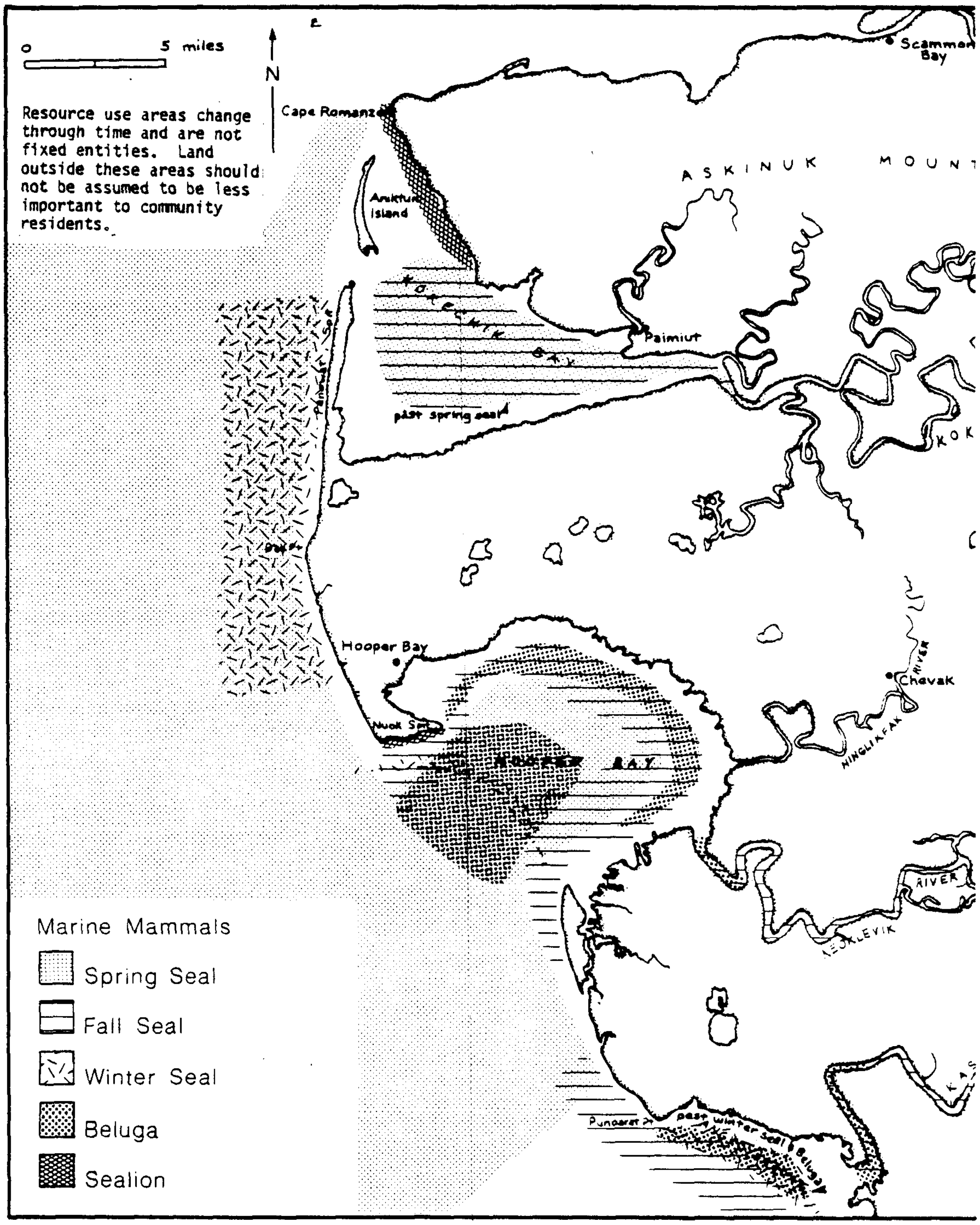


Fig. 12. Marine mammal hunting areas of Hooper Bay residents, c. 1981-1983.

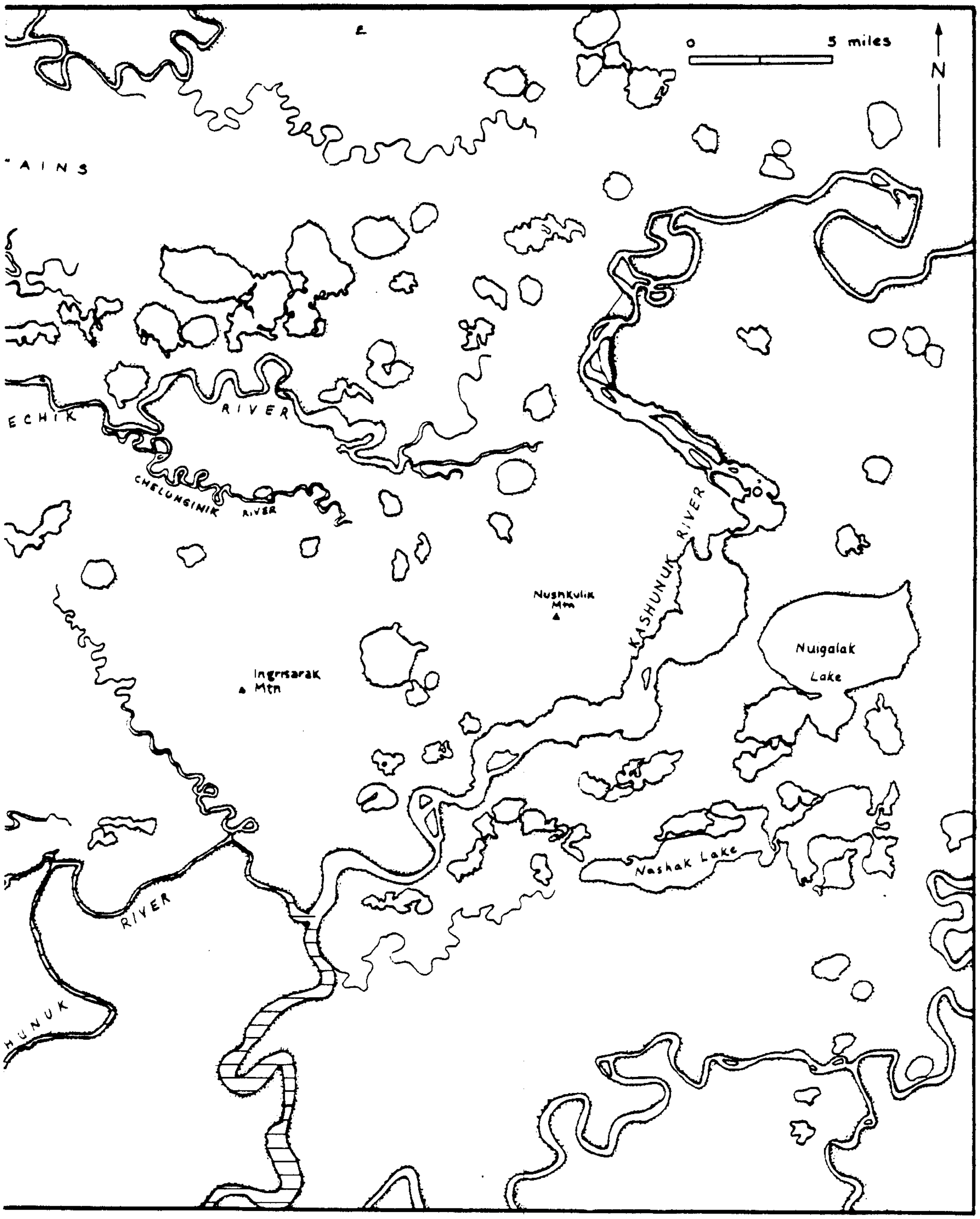


Fig. 12. Continued

Environmental Constraints

Climatic conditions and other environmental factors play a major role in spring seal hunting. Optimum conditions are those in which the floes of the deteriorating pack ice are present in moderate to high densities close to the shorefast ice and the weather is generally calm. If the floating ice floes are present only in low densities, seals will be widely dispersed. If the pack ice is far offshore and the weather is calm, the men may choose to go far offshore in order to hunt.

People stressed that weather around Hooper Bay was highly variable, often changing quite rapidly. The residents of Hooper Bay are cautious about the weather and before taking any long trips whether on land or by water, they usually observe cloud formations in the Askinuk Mountains, which frequently signal inclement weather, and other weather indicators. While hunting for seals far offshore, hunters keep sight of the mountains, not only to guide themselves back home, but to monitor changing weather conditions. Seal hunting is considered a dangerous activity, even with modern technological advances. As recently as the spring of 1982, several seal hunters from Hooper Bay were stranded overnight in the pack ice when an onshore wind packed the floe ice around the shore, in effect "locking" the hunters away from the more stable shorefast ice. The hunters were able to return home the next day with improving conditions.

Weather at times influences the species the hunters select to harvest. At Kokechik Bay, hunters generally hunt for seals only and will not pursue belukha or sea lion because of their greater weights. It is risky carrying a heavy cargo should they need to return quickly to Hooper Bay because of bad weather.

Another environmental constraint which usually occurs late in the spring is the deteriorating condition of the snow which may make traveling out to the edge of the ice to seal hunt difficult. As the temperature grows warmer and the daily solar insolation greater, the snow starts melting at a rapid rate and becomes unable to bear much weight on its surface. Snowmachines bog down in these conditions and it becomes difficult to transport heavy sleds laden with boats and gear. Men continue to hunt during this period, but it makes traveling to and from hunting areas cumbersome and places restrictions on the weight which can be hauled and the routes that can be travelled.

Logistics and Techniques

The gear used for spring seal hunting include lightweight aluminum skiffs which range in size from 16 to 20 feet, 1 or 2 outboard motors (25 to 40 hp.) 6-gallon gas tanks, rifles (.222 or .22 - .250 caliber), 12 gauge shotguns, gaff hooks, harpoons, knives, oars, tarps, engine tools and binoculars. Hunters also take food along such as "poke fish" (salmon preserved in seal oil), cooked seal meat, bread, crackers, akutaq, and tea.

It usually takes at least two snowmachines and one sled to transport the full complement of equipment that each hunting party requires. The boat is not placed on a sled for transport but is dragged behind the snowmachine by itself. At the end of a day of hunting some hunters leave their boats on the shore ice, far enough back from the edge to avoid losing the boat in case the ice breaks off. Most hunters transport their boat and gear to and from the village each day that they hunt.

A hunter typically uses one outboard motor for his boat with an extra

motor taken along in the event the other fails. Two or three six-gallon tanks are taken insuring enough gas in case the boats have to go far offshore. The hunters use binoculars for searching for seals and other animals. After an animal is shot, a short-handled gaff hook is used to hook the carcass before it sinks and to help haul it into the boat. Harpoons are used with seals that have only been wounded. The detachable point is attached by a lead line to the shaft of the harpoon, enabling the hunter to retain some control over the wounded seal once it has been struck and to facilitate retrieval. The seal is then dispatched by rifle. Straight knives are used for field butchering. Shotguns are taken for incidental hunting of eiders and other waterfowl while hunters are out on the ocean. The tarp provides a windbreak and some shelter for extended times when the hunters wait and watch on the ice or when they break for a hot drink and food.

Hunting parties are usually made up of two and sometimes three males. Occasionally women accompany the hunters, although this is not common. Hunting partners at this time of year will most likely be father-son or brother-brother combination, although other relatives may form partnerships. Younger men may hunt with friends. Reportedly, seal crews tend to be stable partnerships, especially among older men, often lasting several years. Occasionally a younger son or brother will be taken along, in order that he may learn the skills of seal hunting. If a person's regular partner cannot go hunting for reasons beyond his control, he may choose someone else to take his place. Partners from different households will often pool equipment.

At least two different methods have been noted for spring seal hunting by Hooper Bay hunters. One method, similar to that described for

Kwigillingok, is to cruise along the shorefast or nearby floe ice. In this method, the boat is regularly pulled up on the ice to scan the area and to permit a steady shot when a seal is spotted nearby. If a seal is sighted too far from the shorefast ice to permit a shot, a series of repositionings of the boat in the water are used to bring the hunters closer to the emerging seal.

The second method is employed when there is no floe ice visible in the area. Hunters pull their boat up on the shorefast ice and wait, searching for seals which may come into the vicinity. This is similar to the technique used for hunting with a kayak. The boat is kept ready to launch, in case a seal is shot near the ice or sighted far off the ice. The hunters often wait on the ice for three hours or more, keeping quiet while they watch. Sound carries great distances over the water and is believed to scare seals away from the area. There are days when no seals may be sighted by a hunting party and they return home without any seals or waterfowl.

Disposition of Harvest

Butchering of seal takes place in the village by women, except for bearded seals which are butchered by men while in the field. When a bearded seal is harvested, hunters pull their boat up on either the shorefast ice or a large, sturdy ice floe. The seal is cut open from the chin to the anus and the blubber and skin separated from the carcass. The meat is then cut up for division between the partners, if not from the same household. The partner who actually shot the seal keeps the blubber and hide, the intestine, most of the organs and the majority of the meat. The other partner gets one of the legs (hind flipper), a

portion of the ribs and other meat. If during the time of field butchering other boats arrive which have been unsuccessful, they are given a portion of meat. Likewise, upon arrival at the hunters' starting point, if there are any unsuccessful boats there, they too are given a portion of meat.

Once seals are brought back into the village, they become the responsibility of the women of the hunter's household. There is a differentiation between species as to how the seals are processed and distributed within the village. Spotted and ringed seals are usually not distributed beyond the family network, even if they represent the first seal caught by the household, unless it is the first seal caught by a young novice hunter of the household. This first seal is cut up in strips and distributed to the elders of the community. The first bearded seal harvested by any household member is subject of a much wider pattern of distribution. The meat is separated from the bones in preparation for drying and freezing and the blubber is separated with an uluaq from the skin. For village-wide distribution the blubber is cut into chunks roughly 2" x 2" x 3" or 4". The distribution begins with the elders of the community receiving the largest portion of a household's first bearded seal. The number of chunks of blubber distributed along with a piece of meat to other households is determined by the number of resident post-pubescent women. Meat is distributed with the blubber. Subsequently harvested bearded seals are primarily shared within the extended family network, as are spotted and ringed seals. The household unit keeps the blubber and most of the meat, and some meat may be distributed to both sides of the family within the village. Seal meat is commonly sent to relatives living in other villages. Also, any nonrelative within the village who

comes to a house asking for meat customarily receives it.

Much bearded seal meat is air dried as thin, irregular strips. Larger blocks of meat are cut for freezing by those households with freezers. Some meat also is eaten fresh after being boiled until "halfcooked". The blubber is cut into strips 2 inches wide and 12 inches long, packed into containers, and rendered into oil. The intestine of bearded seals is rinsed and scraped. Some women further process the intestines by inflating and air drying them after they have been soaked in water or urine for several days. Intestines prepared in this fashion are made into waterproof rain parkas. Some women said they also like to take the intestines of small bearded seals (maklagak) after they have been rinsed and scraped and cut them up for use in akutaq; this type of akutaq is highly prized. Once the outer lining of the intestines has been peeled off, it is boiled and eaten, being similar in consistency to sausage casing. Many of the organs such as the heart and liver are also eaten fresh or are frozen for later use. The hide is usually slipped of hair and then dried. Tanning and scraping of the hide takes place at a later time. As in Kwigillingok, the hides of the young bearded seals are used to make the soles of skin boots.

The smaller seal species such as the ringed and spotted seals are often processed similar to bearded seals, although their intestines are not used. Because these seals are relatively small, their skins can be made into "pokes" or storage containers for oil and dried fish. To prepare a poke skin, a single incision is made around the muzzle of the seal and the woman loosens the skin from the carcass and blubber through this incision using either a homemade short handled stubby knife or a small uluaq. It is a laborious process which requires expert manual

dexterity so that no holes are cut in the skin. Once the front flippers are reached, the bone is severed at wrist joint and afterward it becomes easier to peel back the skin towards the hind flippers, which will also be severed at the joint. The skin is then turned inside out, the excess blubber removed and the outside oiled to remain pliable. The blubber is removed from the carcass to be rendered into oil. The meat is processed for drying and freezing like that described above for bearded seal meat.

The hides that are not processed for use as pokes may be used to make articles of clothing. Hides slipped of hair before being dried can be made into the uppers of waterproof boots. Alternatively, hides not slipped prior to drying can be used for boot uppers, mittens, and other articles of clothing such as parkas and hats.

Early during spring seal hunting, if a hunter brings back more seals than the women of the household are able to process at that time, they may freeze some of the seals intact in their store house or cache. They will thaw these seals in the house at a later date, for processing. It was said that the quality of seals handled in this fashion is similar to seals cut when they are freshly caught.

As in Kwigillingok, spring seal hunting is important to the residents of Hooper Bay not only in terms of the meat and by-products it provides, but also because of its timing in the annual cycle. For a village that has been on a winter diet of frozen or dried fish and other stored foods that might be dwindling, spring seals represent the first major source of fresh meat to the villagers. Some of the by-products, such as seal oil, poke skins, maklagak (subadult bearded seals) skins, and sealgut cannot be replaced by any other resource locally available. The majority of the seal oil a household uses throughout the year will come from the

spring harvest. Hunting during this time also reaffirms the ties between partners through cooperative action and between individual families and the rest of the village, through patterns of sharing. For Hooper Bay residents as for those of Kwigillingok, it is not just the gross poundage of meat and by-products that make seals so important to the local economy, but their intrinsic value and critical timing in the annual cycle that make them a significant resource.

Walrus Hunting

Location and Timing of Harvest

Very few walruses are harvested by the residents of Hooper Bay. Most people interviewed indicated that the walrus herds travel far off the shores of Hooper Bay during their migration north and that the hunters usually did not see them. If hunters are particularly far offshore hunting seals, they may occasionally sight a group of walrus. Rarely a solitary walrus may come in close to land. If hunters see walrus in these rare circumstances within proximity of their boats, they will pursue them. Walrus migrations off the Yukon-Kuskokwim Delta coast appear to coincide with the latter part of the spring seal migrations. The locations of walrus harvests for Hooper Bay residents appear to be highly variable because of the rareness of sightings of this resource. Harvest locations range from just off the shorefast ice within Hooper Bay to sites far offshore from Hooper Bay.

Dead walruses occasionally wash up on the beach area running from Nuok Spit to Panowat Spit. These are walruses which have died of natural causes or have been shot by hunters in other villages and lost. If there is a

storm with a strong onshore wind, several walrus carcasses might wash up. These are utilized by Hooper Bay village residents depending on the condition of the carcass.

Environmental Constraints

Environmental constraints on hunting walrus are similar to those on seal hunting. The weather has to be relatively calm and the pack ice far offshore for the hunters to venture far enough out to intersect with migrating walrus. The major constraint on the Hooper Bay hunters is that the migrating walrus travel so far offshore that sightings are uncommon. Consequently, the hunting of walrus occurs opportunistically.

Logistics and Techniques

Since the sighting of walruses is so rare, Hooper Bay hunters do not equip themselves especially for walrus hunting. As walrus hunting occurs while men are seal hunting, seal hunting gear is also be used for hunting walrus. The same is true of hunting crews composition.

It is preferred to shoot a walrus at close range when it is on a fairly large ice floe, to minimize the risk of the shot animal falling off the ice and sinking. Females can weigh 1,500 pounds and males over 3,000 pounds (Kenyon 1978). A two-man crew is unable to pull a struck animal up onto an ice floe. Killing an animal on a large ice floe also provides the hunters with a landing platform for their boat and facilitates the field butchering of the walrus.

Disposition of Harvest

Field processing and distribution of walrus is similar to that of

bearded seals. Processing the walrus at the village is the job of women. Walruses are distributed widely in the village, to relatives and non-relatives alike. This pattern of generalized, village-wide distribution beyond kinship lines is done for large mammals, such as walrus, belukha, grey whale, killer whale, and locally harvested ungulates that are only rarely taken by the village residents. The distribution is so extensive that these resources are usually eaten immediately within the period of a few days. There is usually not enough to process for later use. Walrus hide is prized for eating raw or for soups. As with seals, most parts are utilized. Undigested clams taken from walrus stomachs are eaten and considered a delicacy. The tusks and teeth are prized by ivory carvers in the village. Hooper Bay has several active carvers, but they are usually dependent on buying or trading for ivory from people in other communities with better access to walrus. Beached walruses help supply the villagers with an occasional source of ivory, as well as food.

In sum, walruses are not a common resource occurring close to Hooper Bay. Therefore they are not a stable, constantly reoccurring part of the local food supply and their contribution to that supply is small. Their harvest is opportunistic and random. However, because of their size and their rarity, once harvested they are subject to a village-wide distribution and assume a far greater importance to the village that just the gross quantity of meat would imply. They add diversity to the diet, as well as providing items such as ivory and skin which no other resource provides.

Waterfowl Hunting and Egg and Down Gathering

Location and Timing of Harvest

The location of waterfowl hunting varies by species (Fig. 13). The eider species are most commonly encountered and harvested off the shorefast ice by seal hunters during March, but occasionally as early as January and February. As the pack ice and shorefast ice break up, these birds flock up for their migration north. Local resource people say that usually in late-April there is two to three major migratory waves of eiders with flocks of up to 1000 birds which may pass close to the beach before shifting northwest at Dall Point. Hunters position themselves along the beach to take advantage of this migratory habit. The single largest harvest of eiders occurs at this time. Smaller migrations of eiders follow the larger waves, with fewer numbers per flock.

The harvest locations for summer migrant waterfowl will vary depending on the species and timing during the season. Species such as Emperor and Canada geese and various loons that migrate along the coast and arrive usually by mid-April often stay just off the receding edge of the shorefast ice in protected areas such as bays. Where encountered, these birds may be taken by seal hunters. As ice and snow deteriorate, exposing the tundra, birds nesting around Hooper Bay move inshore; other flocks continue their migration to other more northern nesting grounds. Once the birds move inshore to nest they are hunted either on land, along waterways, or in bays, wherever they are encountered.

Hooper Bay residents also have access to a wide variety of eggs including those of seagulls, terns, shorebirds, waterfowl and ptarmigan. Wild bird eggs are only available for a limited amount of time. During

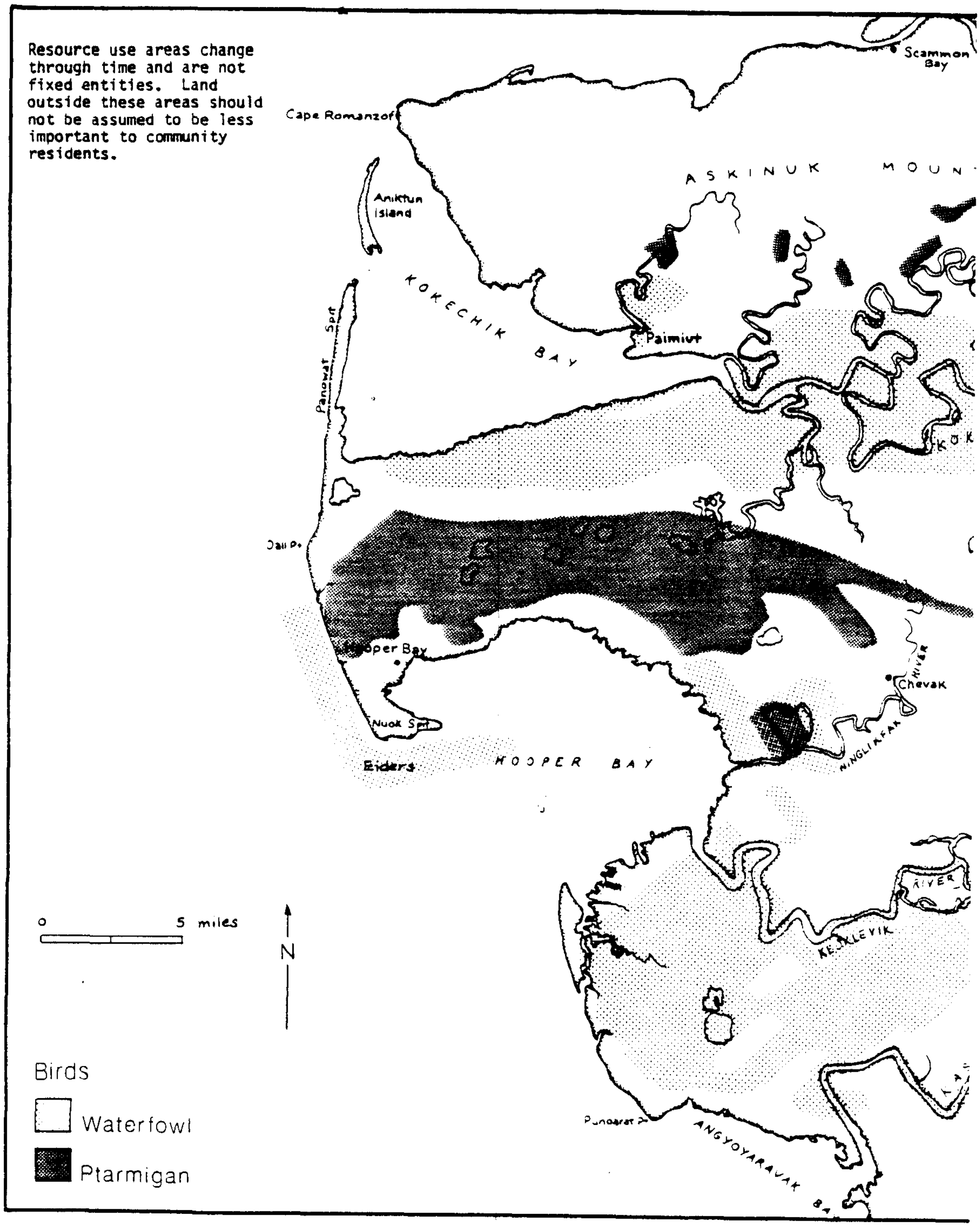


Fig. 13. Bird huting areas of Hooper Bay residents, c. 1981-1983.

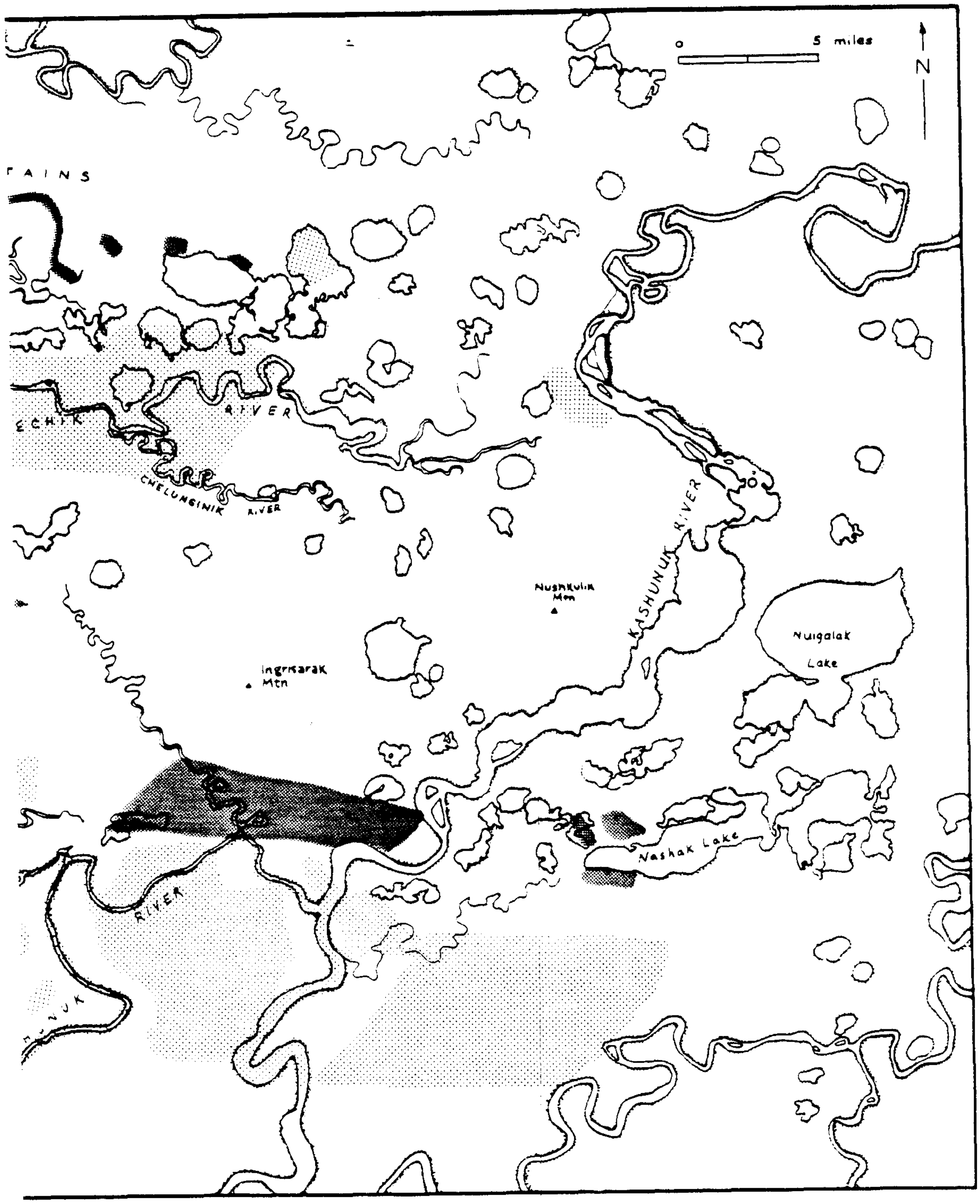


Fig. 13 Continued

years of early to moderate springs when the snow is substantially gone by early to mid-May, the initiation of nests by most waterfowl species is usually during mid-May. However, in 1982, a year of persistent late snow cover, most nests were not initiated until the first week of June (Byrd et. al. 1982). Incubation rates for different species vary in length. Sandpipers average less than 20 days incubation, waterfowl range from 21 to 28 days, and gulls average around 28 days (Terres 1982). Therefore, the actual time available for people to gather eggs is usually less than a month. Generally most families do not target on just type of bird egg, and there are only a few species of birds whose eggs are not used.

Although all the tundra within a few miles radius of Hooper Bay and the coast will potentially contain nests, some areas are better habitat for certain species than others. These are high density nesting areas for brant and seagulls located along Kokechik Bay. The location of egg collection depends in part on the mode of transportation chosen. For day trips people commonly walk out from the village and either search in the vicinity of the village near the beach or head north and east to the plateau that runs in a easterly direction, north of village. Some people walk all the way to the Kokechik Flats which supports a high density of nests of gulls, brant, cackling Canada geese and other species. They also search the plateau area going and returning.

Some families travel by boat to more distant locations and take short camping trips lasting two or five days. A wide variety of resources are harvested from spring camps. Some members of the family gather edible plants and eggs; other members may hunt for birds and fish for whitefish while out. Areas that people travel to by boat include Kokechik Bay, Kokechik River, the land between and along the lower portions of the

Keoklevik and Kashunuk rivers, and sometimes less frequently the lower portion of the Aphrewn River which empties into Hazen Bay south of the Kashunuk River (Fig. 13).

Compared with edible greens and eggs, the gathering of down from the nests of waterfowl is a relatively minor activity. Only a few people in Hooper Bay regularly gather down, using it in the production of winter clothing and bedding. People gather down in the same areas where they gather eggs, however the timing is usually slightly different. Most people who gather down do so during mid-summer after the eggs hatched and the nests abandoned. Only some people noted that they might gather down while they were gathering eggs.

Environmental Constraints

The major environmental constraints on hunting eiders appear to be their relationship to the shorefast ice and yearly variations in their migratory route near land. Eiders are usually in the vicinity of Hooper Bay until mid to late April. The numbers taken by seal hunters offshore depends upon whether snow and shorefast ice conditions permit travel to the edge of the shorefast ice. Depending on the prevailing ice and wind conditions each day eider flocks may be quite close to the edge of the shorefast ice; at other times, they can be far offshore with the pack ice. During the major migration in late-April, if there is a strong onshore wind, the large eider flocks may fly parallel to the shoreline of Hooper Bay and near the beach until they reach Dall Point, veering to the northwest. They are not seen near the beach north of that point. Their proximity to the beach when they migrate varies depending on the wind direction at the time of migration. On days with strong offshore winds,

flocks may fly far offshore in a northwesterly direction, unaccessible to the local hunter except by boat.

Snow and ice conditions influence the hunting of summer migrants as well. When summer migrants arrive about mid-April, the snow is deteriorating rapidly and surface travel by snowmachine can become difficult. At this point most hunters will wait until the waterways become clear of ice in order to use boats to travel to favorable spots, or they will hunt on foot from the village. Traveling conditions may remain difficult for longer than a week.

Environmental constraints that affect the harvest of bird eggs involve those that influence the nesting and nesting success of the bird species and the factors that affect peoples' ability to go out and gather. Birds that nest on the tundra must wait until the tundra is largely free of snow before constructing nests and initiating clutches. During a late spring such as 1982 with late persistent snow cover and melt water flooding, a two-week wait to initiate nests can deplete the energy reserves of many migrating species. There is evidence that in 1982, many geese started building nests to the point of depositing down, but apparently never laid (Byrd et al. 1982). Most hunters and gatherers in Hooper Bay felt that the spring of 1982 was a poor one for waterfowl in general.

Weather conditions affect the gatherers themselves. Camping trips by boat generally are not made during stormy weather nor are long distances across the bay or out on the sea attempted under any weather conditions not considered safe for such travel. For gatherers traveling on foot, there are fewer constraints. However, most choose not to go out during inclement weather.

Logistics and Techniques

Gear requirements for waterfowl hunting are fairly simple, including shotguns, boats, and snowmachines. The most commonly used shotgun by Hooper Bay hunters is the 12 gauge shotgun although smaller gauge shotguns may be used. Other gear used for waterfowl hunting are usually accessories or relate to the transportation mode. Hunters that hunt on foot from the village may be equipped with backpacks, plastic bags, knives, raingear, and some food. If hunters plan to camp, they may or may not take a tent.

Hunters using snowmachines will usually hunt on daily forays from the village because they can travel greater distances in a short time. As the snow cover is usually deteriorated at this time, it is best to travel light and return each night to the village than to camp at a great distance from the village and risk not being able to come back with the snowmachine. Sleds are generally not taken along. Hunters wear clothing appropriate for the weather and conditions and also carry some kind of backpack as well as the shotgun, in addition to food, and drink, items of general utility such as knives and snowmachine tools. Hunters traveling by boat considerable distances from the village may take along enough equipment so they can camp for a few days. This might include a tent, Coleman stove, kettle, and cook pots and sleeping bags. Boats may also be used for day trips.

Parties for land-based waterfowl hunting are less rigidly structured than those for spring seal hunting. Waterfowl hunters are usually men who are younger than 50 years of age. In a family with several males, the men aged from the late teens through the 30s tend to be those who

hunt summer migrants. Hunting waterfowl is labor intensive work requiring a moderate level of skill. The activity is not generally as dangerous as seal hunting and there is less of a demand for a large body of environmental knowledge and expertise. While there are still a lot of older men involved in spring seal hunting in Hooper Bay, many of them leave waterfowl hunting to their sons.

Hunters hunt singly or in groups of two or more. Typical configurations include brothers, fathers with young sons, cousins, or other extended family relationships, and non-relatives. The configurations may change for each hunting trip or in the cases of brothers or father-sons may stay the same.

The gathering of bird eggs and down, like waterfowl hunting does not require a lot of specialized equipment. The major requirement is for some kind of container to hold the eggs and/or down. Containers might be loosely woven grass bags, backpacks, small buckets, and pots. Other gear is largely incidental, but would include appropriate clothing, whether harvesters are going by foot or boat, food and drink, and camping equipment if required for longer trips.

Participation in egg gathering has no real age restrictions, but is more dependent on physical ability to walk for several hours or more over the tundra. Participants can range from small children to elderly women. This is one of the first activities that small children will be initiated into and become contributors to their family's food supply. Gathering greens and eggs also gives women and children one of the first opportunities to spend an extensive amount of time outdoors after a long winter of being mostly inside. Gathering groups can range from one person to several, although small groups are the norm. Common gathering

group composition will include sisters, mother-children, aunts, niece/nephews and other extended family combinations involving females. Group composition may vary on each outing and does not appear rigidly structured. Men participate occasionally, especially during the camping trips. However, they may choose to hunt and fish as well as gather during these trips.

It should be noted that most gathering trips are multifocused. They are often not aimed at the harvest of one specific resource. Thus while short trips might be made at the beginning of egg season to expressly gather eggs, it is more likely that a combination of resources might be harvested, such as eggs, several species of greens, and possibly down. On the longer trips by boat, typically other resources are harvested.

Whether going on foot or by boat, collecting eggs means extensive walking over large areas of tundra searching out the appropriate habitat for certain plants and looking in likely spots such as near ponds for nests. Different gatherers have different ways of gathering eggs. When a nest is located, some gatherers may remove every egg if it is a species that is well liked, such as sea gull eggs. Other gatherers will only remove a few eggs from each nest leaving at least one or more to hatch. The latter method is probably more prevalent than the former. When down is collected off nests during nesting season, usually it is taken out of nests where all the eggs have been removed. When some eggs are left, only part of the down will be removed. Most people who collect down stated that they usually collected the majority of their down after the eggs were hatched and the nest abandoned. At this point they could return to the nesting grounds and remove the down from any or all nests found.

Disposition of Harvest

Any waterfowl harvested belongs to the household of the hunter who shot them. As with seals, once the waterfowl are brought back into the village they become the domain of the women of the household. Most waterfowl are usually processed in similar fashion regardless of species. The eiders are an exception. Eiders are usually skinned, not plucked, and while they can be eaten fresh or frozen, some households will dry them for later use. This is not done currently with any of the summer migrant waterfowl. Summer migrants are plucked and, if desired, the down retained.

Waterfowl of all species are usually used in soup, cooked to a medium rare consistency ("half-cooked"). Included in the soup is the entire eviscerated carcass (cut-up), the head, feet and legs, gizzard, liver, parts of the crop if in good condition, and undeveloped egg yolks if present. Very little of the bird is wasted. In the past, even the skins of the eiders and loons were used to make warm parkas, although people now buy or make their own down garments. Feathers are used for dance fans and for other ornamentation and the wings of very large birds are retained as a type of household whisk broom. Some fresh waterfowl are roasted or baked. Because of the different qualities of the meat of different species, some are preferred strictly as soup, whereas other species are considered good for both soup and for roasting.

If not eaten fresh, waterfowl usually are frozen for later use by those with freezers. The birds are frozen whole without plucking to prevent freezer burning. Some families without freezers pack plucked eviscerated birds in barrels with salt for storage. This also is done by

families with freezers when their freezer is full.

Waterfowl are not subject to village-wide distribution. They are mainly retained by the immediate household, although sharing is done with others in the extended family network and with family members residing in places where waterfowl are not so readily accessible.

Waterfowl provide only a small portion of the overall food supply, but are a very valued component. They are a very choice food that is only available for a limited time each year. Before residents had access to freezers, other methods of preservation were less suitable or satisfactory and waterfowl could not be retained for long periods of time. Thus their major use was for immediate consumption during the few months of their availability which gave them an even greater value as a food item. In past years of poor spring seal harvest, the timing of waterfowl was such that they provided a buffer to the reduced food supply until the herring and salmon arrive (Sullivan 1918) and do so to a lesser extent today. Now that some families have freezers, they will retain some of the choicest birds for special meals late in the fall and winter and for diversity in a diet that is predominantly made up of dried and frozen fish.

Unlike waterfowl, most eggs harvested are eaten within a short time after being harvested, as they are hard to store for long periods of time, especially since most households do not have refrigerators. When large amounts of eggs are brought back to the house, they are usually stored in a cool place in a large container with cold water until they are needed. As in Kwigillingok, while eggs are available, they are hard boiled and accompany most meals and are also eaten as snacks.

The presence of regular air service means that a fairly reliable

source of year-round domestic eggs is available in Hooper Bay stores. However, chicken eggs shippped into Hooper Bay are fairly expensive ($2.00/dozen), and are not considered comparable in flavor or use to wild bird eggs by residents. As with edible greens, store-bought eggs are not considered a substitute for the local eggs whose flavor is prized. The value of wild bird eggs to the people's diet is enhanced by the fact that they are only available a limited time span. The opportunity to gather eggs and greens is also eagerly anticipated in the waning months of winter as it offers women the first real freedom to spend extensive periods of time out of the house after a long winter. Thus, the gathering of edible greens and bird eggs provide households with valued food items and a culturally valued activity.

Beaver Hunting and Trapping

Location and Timing of Harvest

Beaver have become established in the Hooper Bay region, especially along the Kashunuk River east of Ingrisarak Mountain, along the Ukalikchuk drainage, in the Kokechik river system and associated lakes of the southern flank of the Askinuk Mountains (Fig. 14). Each year beaver are spotted in new locations, indicating that they are still colonizing the area.

Since beaver are recent newcomers within the past decade to the Hooper Bay area, the local people do not have a long history of association with this resource. However, they have incorporated these animals into their annual round. Hooper Bay residents usually take beaver during and after the break-up of river ice and during the summer when the animals are

dispersing and are more accessible. There is only a limited harvest during the winter, when beaver are spotted as men travel across the tundra. Most beaver harvest occurs in conjunction with other activities. Men usually do not travel the long distances involved solely for the purpose of harvesting beaver.

Environmental Constraints

Beaver tend to be less visible in the winter than during other seasons. They seek the security of their homes during the day, and become active at night. Such habits reduce chance encounters between winter travelers and beaver.

The tendency of beaver to disperse during the ice-free months makes them more vulnerable to harvest at that time. There are more daylight and twilight hours available to the hunters, as well as more moderate climatic conditions than in the winter. During dispersal there are greater numbers of beaver traveling.

It should be noted that although in other regions of the country the beaver's habitat modifications have been welcomed as beneficial, along the coast of the Yukon-Kuskokwim Delta, the recent colonization movements of this animal have been considered detrimental. According to local residents, their alterations of streams have affected the habitat of important winter fish species and deter the navigation of boats along streams.

Logistics and Techniques

Beaver are usually harvested with small caliber rifles. Since they are primarily taken during ice-free periods, the hunters travel by boat. Men may hunt beavers individually or in small groups such as father and

son, brothers, or, more occasionally, friends among younger men.

Beaver hunting, like the hunting of fox, ptarmigan, and muskrat, employs a generalized search pattern. Hunters tend to search large areas of likely habitat looking for the animals, shooting those that they encounter. Beavers are usually shot at dusk when they are most active. Also, beaver are taken whenever encountered while a hunter is engaged in other activities, such as bird hunting or berry gathering.

Disposition of Harvest

Beaver are skinned and their hides stretched in a circular form and dried. Very few beaver skins are sold on commercial markets. Beaver pelts are used as trim for parkas and ruffs and for other articles for winter clothing. They are highly valued because of their utility. Beaver meat is eaten by residents.

Muskrat Hunting

Location and Timing of Harvest

Muskrat currently are harvested in relatively small quantities by residents of Hooper Bay. In the past, when there was a high demand for the skins by furbuyers, many men were active muskrat hunters. In recent years, the price for muskrat pelts has only been a few dollars per pelt. Thus, even though a few men still sell muskrat pelts, the majority of the small harvest is for home use. The best time to harvest muskrats around Hooper Bay is during and right after break-up of the river ice when high melt water on the tundra enables extensive travel by boat. Break-up also coincides with the spring dispersal of muskrats. In the past, muskrat

hunting took place along most of the major river systems such as the Kokechik and Ninglifak Rivers (Fig. 14) with some people going as far as Kusilvak Mountain. Presently muskrat takes place along the streams draining the plateau north and east of the village and along the Ukalikchik River. Hunters do not usually establish spring camps, nor was this done in the past.

Environmental Constraints

The major environmental constraints affecting the harvest of muskrat are aspects of muskrat population ecology and climatic conditions. Because muskrat populations fluctuate in cycles, in any given year, there may be very few or they may be numerous. Because of their pattern of spring dispersal, the period during and immediately after river breakup is the time when muskrat are most accessible to the residents of Hooper Bay.

As in other activities, climatic conditions influence muskrat hunting. Muskrat were always hunted during periods of high melt water levels that permitted qayaq travel over broader areas than would be otherwise possible. Occasionally when snow conditions prevailed, the kayak was transported to inland areas by dogteams to areas where thawing was more advanced. Presently, those men hunting muskrat occasionally transport their boat inland by snowmachine.

Logistics and Techniques

Today, muskrats are usually harvested using .22 caliber rifles by hunters traveling by wooden or aluminum skiffs. Occasionally muskrats traveling overland are clubbed by the hunter. Accessory gear includes camping equipment and food supplies, since hunters commonly stay out for

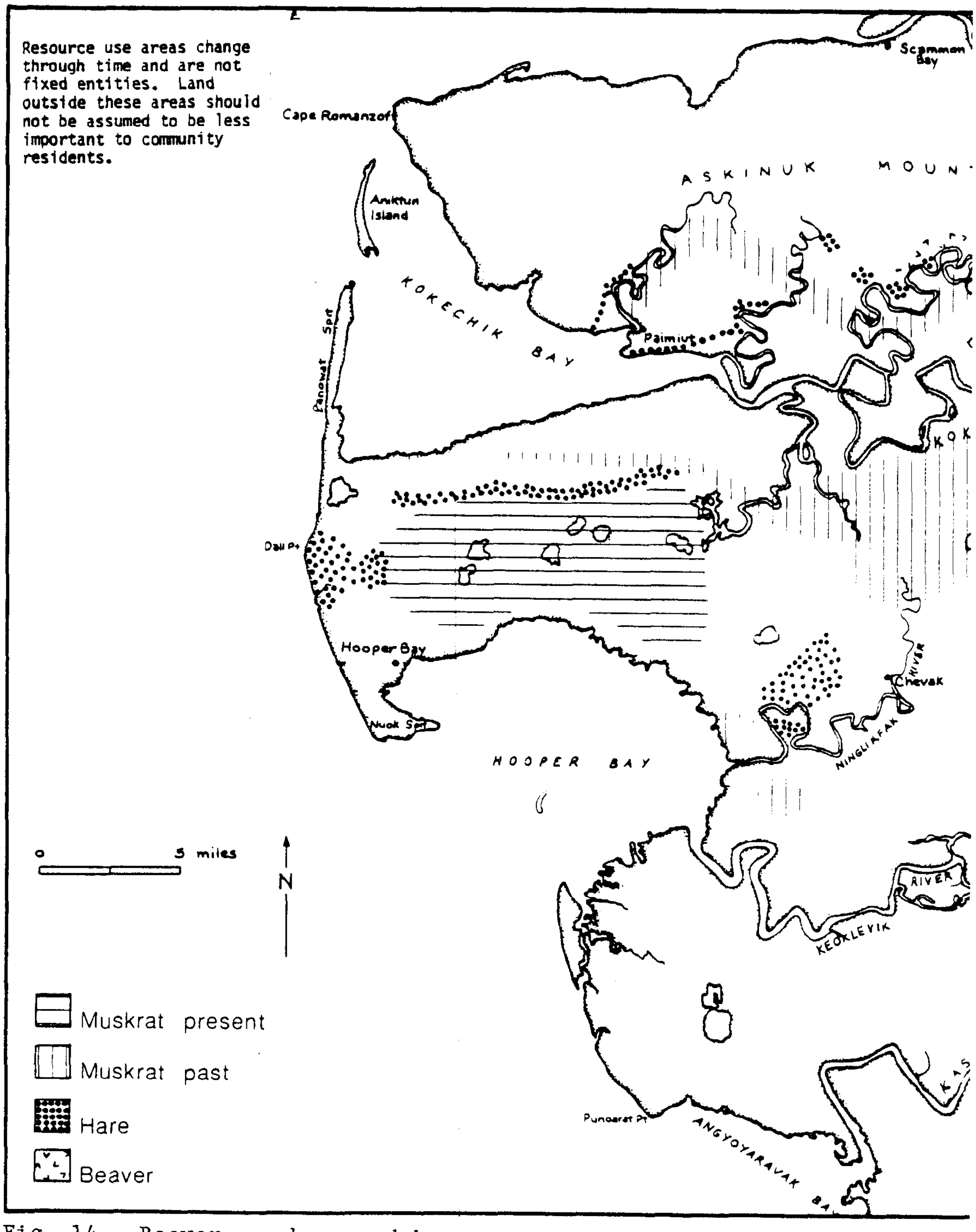


Fig. 14. Beaver, muskrat and hare areas of Hooper Bay residents, c. 1981-1983.

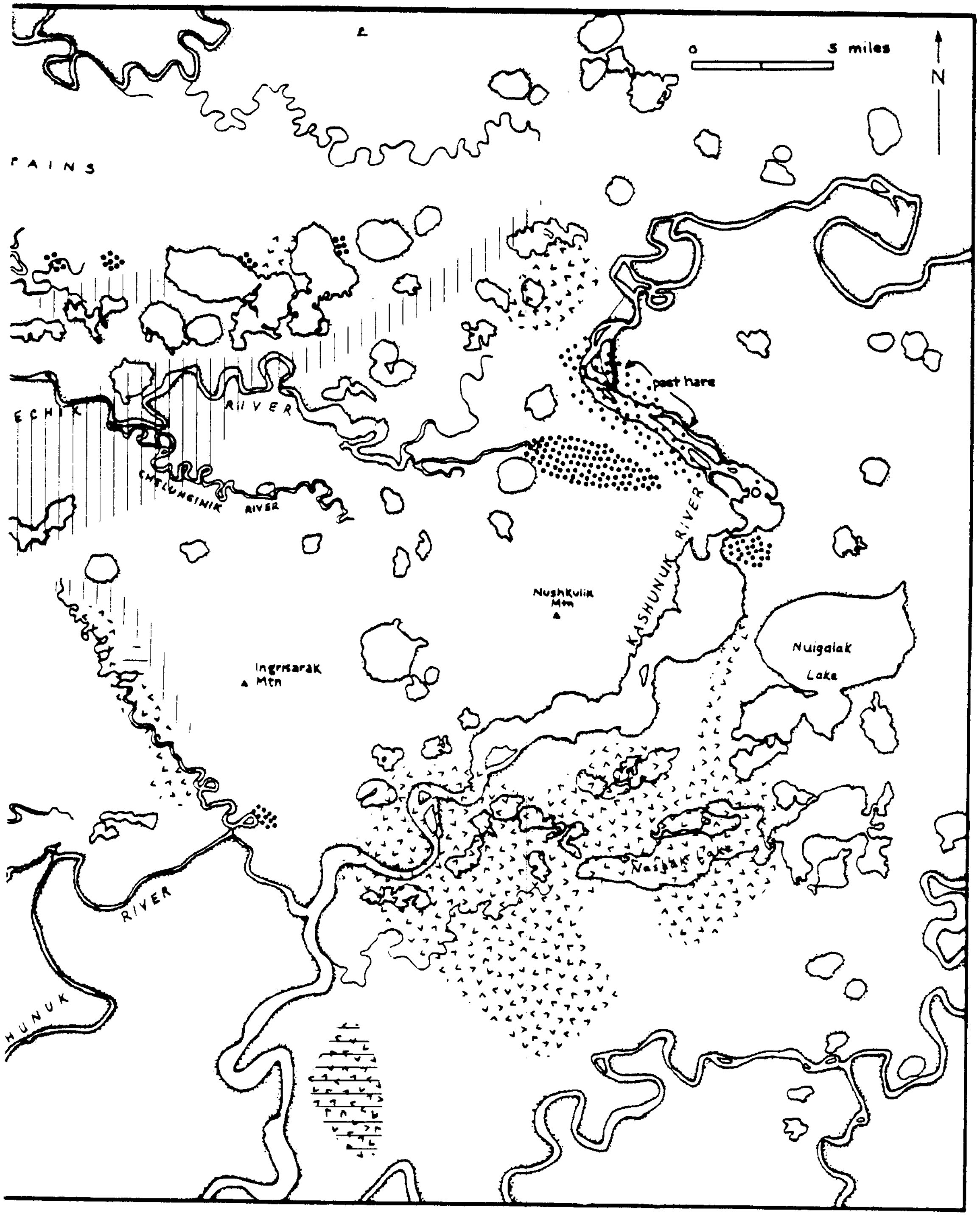


Fig. 14. Continued

a few nights, often combining other harvest activities with muskrat hunting.

In the past, typically the male head of the household pursued muskrat. It was he that usually had the requisite skill in hunting and handling kayaks. Older sons hunted muskrat if the head of the household was infirm or involved in other activities. Muskrat hunting appears to have been an individual pursuit and not done by groups.

In the past, if there was extensive snow cover along the coastal fringe at breakup, the hunter was taken by the dogteam of relatives as far as twenty-five miles inland, and deposited in an area of extensive melt water. The hunter paddled toward the coast over a period of a few days, looking for muskrat. If the thaw had progressed closer to the village itself, it was possible to start out by kayak, paddle inland for several miles, and return home by the same or different route.

Presently, the hunting of muskrats is rare. Men of any age able to travel by skiffs may participate, but most will be engaged with other activities considered to be more important at this time. Small numbers of muskrats are harvested by young boys on foot with proximity to the community.

Disposition of Harvest

Most muskrat that are harvested today are intended for home use. Few pelts are sold. The muskrat is skinned and the pelt is dried. Later pelts are tanned by the women of the household and used to make articles of clothing, such as parkas or the lining of parkas and hats. The meat is eaten by only a few residents. The accessibility of muskrat during break-up conflicts with the economically important harvest of seals,

waterfowl, herring and other resources. The pelts have little value in the fur market and the meat is not sought after for food. For these reasons men choose to engage in activities other than muskrat hunting during break-up and spring. Harvests that presently occur are largely opportunistic.

Herring Fishing

Location and Timing of Harvest

There are two distinct herring fisheries in which Hooper Bay residents are involved: a subsistence fishery and a commercial fishery. The subsistence fishery, which is oldest, occurs along the inside of Nuok Spit at Hooper Bay (Fig. 15). In the past, families residing at small settlements in the Kokechik Bay area fished for herring for subsistence use along the shore near Cape Romanzof (Fig. 15). Hooper Bay residents harvest herring spawn-on-kelp for subsistence use at spawning grounds in Kokechik Bay. The herring harvested inside Hooper Bay apparently do not spawn there. The subsistence harvest of herring usually takes place during the latter part of May through the early part of June, subject to variations due to weather and climatic conditions. Herring runs in Hooper Bay last from five days to two weeks.

Since 1980, Hooper Bay residents have participated in the commercial herring fishery at Cape Romanzof. In 1982, 63 residents had permits. This fishery usually occurs in May, lasting from one to two weeks. Herring usually arrive in Kokechik Bay before they appear in Hooper Bay, and there is only limited overlap in timing. This natural circumstance generally permits fishermen participating in the commercial fishery to return home in time to procure herring in Hooper Bay for their family's food supply.

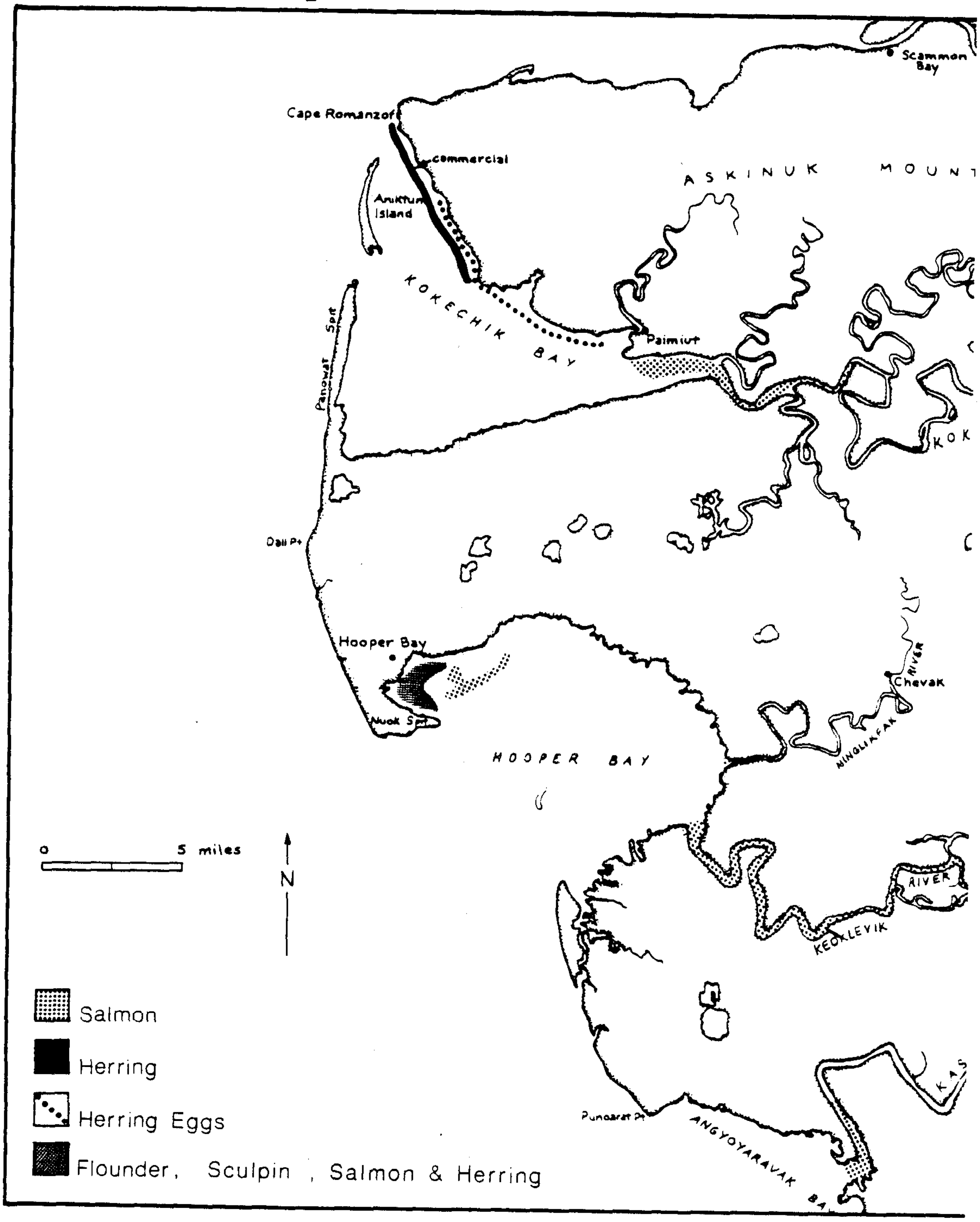


Fig. 15. Marine fish areas of Hooper Bay residents, c. 1981-1983.

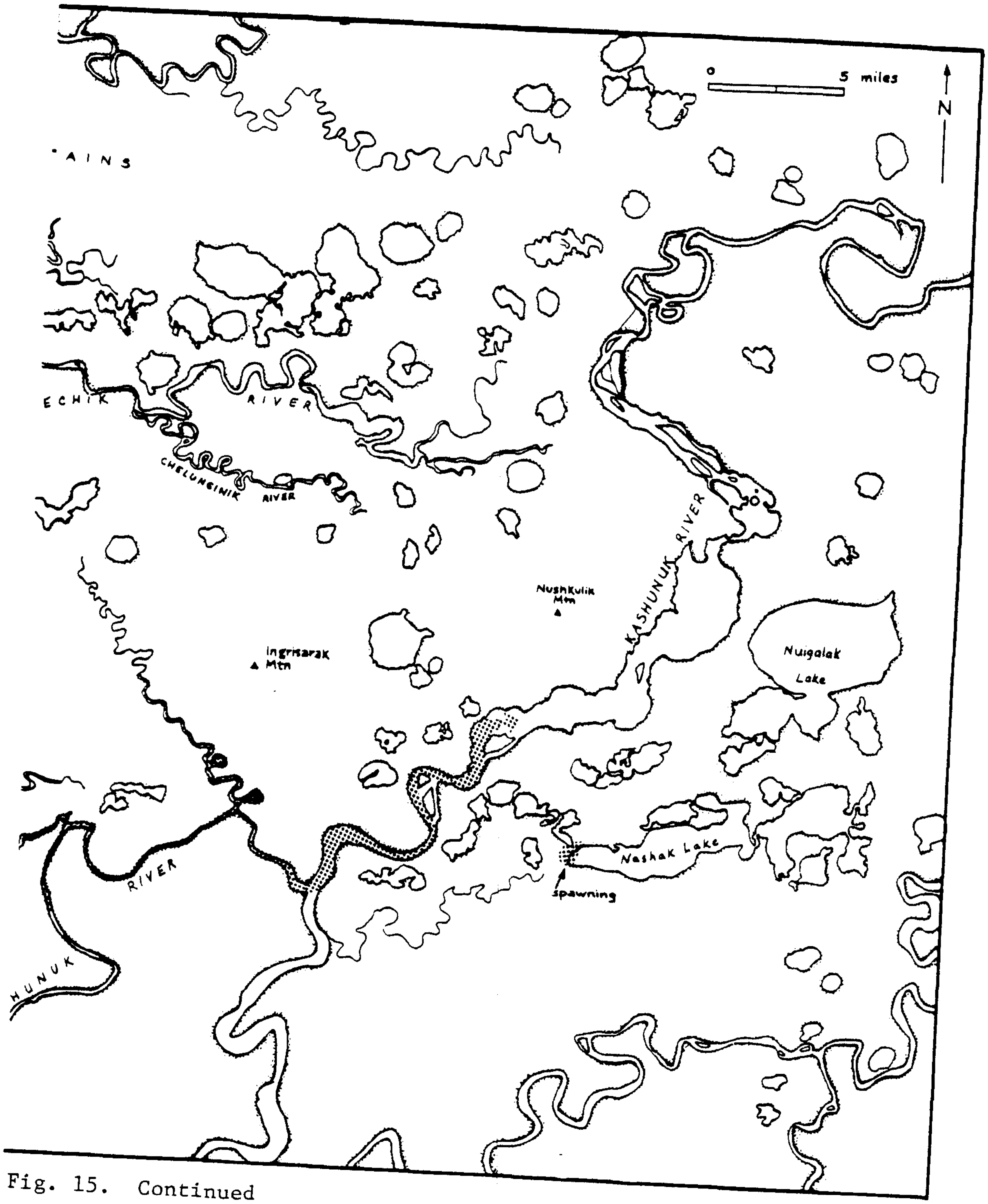


Fig. 15. Continued

In 1982 however, because of tenacious snow and ice conditions in Kokechik Bay which delayed the start of the commercial fishery, by the time the commercial fishermen returned home, the herring run into Hooper Bay was over.

Environmental Constraints

The major environmental constraints on herring fishing involve the behavior of the fish themselves and the climatic conditions during their brief inshore migrations. A major determinant for herring spawning is inshore water temperature (Hart 1973). The timing and duration of the run into Kokechik Bay is highly variable. Often the waves of arriving spawners occur in a brief space of time; some years they are more dispersed over a long period of time. There has been little biological information collected about the herring run into Hooper Bay. It is not known whether there is a limited amount of spawning occurring some place in the bay. Residents state that none occurs around Nuok Spit and the vicinity of the village.

. Usually when herring arrive in Kokechik Bay there is still snow on the tundra around Hooper Bay and commercial fishermen must dig out their snow-drifted boats. They may also have to contend with rotting ice floes and storms on their way north to Kokechik Bay. If a storm comes in when they are getting ready to leave, they will delay their departure until the storm has subsided for safety reasons. Because they are mostly using homemade wooden skiffs that are about 20 to 24 feet in length, they use caution in traveling the ocean between Nuok and Panowat spits. Masses of floe ice in Hooper Bay can also slow their travel to the Cape Romanzof fishery. Rough ocean conditions along the mountainous shores of Kokechik

Bay will also influence fishing and fishing success by delaying or impeding the fishermen.

Usually the snow and ice are gone by the time the herring move into Hooper Bay. However, this is not always the case. Periodically a southwest storm may pack rotten ocean ice into the bay, effectively prohibiting Hooper Bay residents from fishing (Geiger, pers. comm. 1983). The herring swim into the bay and leave before people are able to fish. Other environmental constraints include general storm conditions and tides which make the bay too rough to fish. Because Hooper Bay is a large, shallow tidal bay, low tides restrict travel to fishing areas and actual fishing times.

Logistics and Techniques

The gear used for herring are basically the same for both the subsistence and commercial fisheries -- wooden skiffs and gill nets. Most fishermen use the same woooden skiffs which are used for most other subsistence endeavors except for spring seal hunting. A few men obtained loans through the Kokechik Corporation to build larger wooden boats expressly for participation in the Cape Romanzof herring fishery. Most fishermen involved with the commercial herring fishery use nets of commercial length usually 100 fathoms (600 feet) and 2-1/2 inches in mesh. The nets used in the subsistence fishery average 60 feet in length and 2-1/2 to 3 inches in mesh size. The 3-inch mesh net is also used for taking tomcod, whitefish, sculpin, and flounder. Other gear for herring fishing includes tubs or sacks in which the harvested herring are put, foul weather gear or qalik (sealgut raincoats) and other clothing appropriate for the weather.

Thirty to 40 fishing crews of about 2 or 3 persons each caught subsistence herring in Hooper Bay in 1982. Crew members are usually males drawn from a single family group residing in one or several households. In herring fishing, if there are younger men in the family who are available and able to fish, the elder men of the household may not fish, although they still direct the activity. The composition of the crew may be highly variable, but the unifying principle is that of kinship. Young men at times fish with non-relative friends. If crew members are drawn from two or more households which are not closely related, each crew member may use his own net.

Herring are harvested in Hooper Bay by either a set or drift net deployed inshore of Nuok Spit. A few people drift for herring on the outer coast of the spit. Fishermen stated that herring come in throughout the bay, but most people fish the Nuok Spit area because it is closer to the village. Boats stay out for up to 24 hours at a time, with an average of about 6 to 12 hours. Fishing effort takes place both day and night. Fish brought back to the village are put into pits along the riverbank customarily used by the family of the fishermen. Some of these pits may be filled with water. The fish are placed in these pits for one or more days. The women say this practice "hardens" the fish and make them easier to handle. The men may fish for as many days as needed. The major factors affecting the harvest are weather and climatic conditions and the processing capability of the women of the household. Despite the ability of the men to harvest more fish, they only harvest as much herring as the women in their family group can process. Additional herring is commonly harvested, usually for close relatives who for various reasons may not be able to fish. It is not unusual for members of one

household to supply herring for other related households. For instance, in 1982 fresh whole herring were given to households whose fishermen were stranded at the Kokechik commercial herring fishery by fishermen from other related households, so that the women of those households would have herring to process.

Disposition of Harvest

Once the fish have been deposited in the pits, the herring become the responsibility of the women. Processors generally comprise closely related women, such as mothers and daughters, from one to several households. When the fish have sufficently hardened, the women will prepare them for drying. The heads may or may not be cut off with an uluaq and a fillet cut made along the length of the back, laying open the fish in one piece. The herring is then eviscerated and the eggs are saved and placed in a separate container. The rest of the entrails are place in a "slop" bucket and later discarded. Egg sacks will be spread out on a clean surface such as cardboard and air dried. After cutting, the fish are washed and braided with long strands of grass into ropes about four to five feet in length. Women who leave the heads on the fish braid the grass behind the gills. Women who remove the heads braid the grass around the tail. When the rope has reached the desired length, the rope is placed over a rack and the ends of the rope tied together. Every day a stick is used to rotate the rope on the rack, insuring that all the fish are equally aerated. When the fish are sufficiently dried, the ropes are taken off the racks and put away in a storehouse for later use. The optimum condition for drying fish is dry, breezy weather. The fish are covered if there is rain. If there is a long period of rain and high

humidity during the drying period, it is possible for the fish to mold and eventually to rot, causing a major loss of fish. The weather in late-May through June is generally favorable, however, and this processing method is adaptive for average climatic conditions. Substantial losses of fish occur in some years, but is not common.

The harvest of herring is intricately tied into the harvest of other resources. Some people noted that if they did not get an adequate supply of herring and salmon for their family's food needs throughout the year, they would exploit other resources such as whitefish and tomcod more intensively than if they had sufficient herring and salmon. There also may be a link between spring seal harvest and the intensity of herring fishing. If the seal harvest was poor, families may need to fish up to their maximum processing capability, weather permitting to provide a buffer to the food supply. Conversely, if the seal harvest was favorable families may harvest less herring.

Plant Gathering

The edible greens and other plant material available to Hooper Bay differ in their times and areas of availability. Most of the greens picked are tundra plants and which are locally common; however, their specific habitat sites vary within the tundra around Hooper Bay.

Location and Timing of Harvest

One of the first plants Hooper Bay residents gather in spring is the Pallas buttercup (kapuukaraat, *Ranunculus pallasi*). This plant grows in the margins of tundra ponds and starts putting forth shoots early in the spring usually during the period of snow melt and ice thaw. Hooper Bay

residents gather the young, succulent shoots before they flower during May and occasionally during June. Other plants that may be picked during this time include Labrador tea (ayuq, *Ledum palustre*), sometimes cowslip (allmaruat, *Caltha palustris*), and in the past fiddleheads (ceturnat, *Dryopteris dilatata*). These plants are gathered on foot, most often within a few miles radius of the village (Fig. 16) or using snowmachines while there is still snowcover. In addition, many families travel by boat to other locations for short camping trips expressly to gather greens and collect other resources. The gathering of greens occurs most intensively in May and June, and continues at lower levels throughout the summer, often in conjunction with other activities.

Environmental Constraints

The major environmental constraints affecting spring plant gathering are weather and the plants' lifecycles themselves -- knowing the optimum time to gather for best flavor or other qualities. The kapuukaraat starts growing new shoots soon after the ice has melted off the margins of ponds. The shoots should be gathered before the plant forms new rootlets and produces flowers. Ease of access can depend on snow conditions and ice melt, but do not appear to be much of a limiting factor, except in terms of snowmachine transportation. All the other plants are gathered on foot, with boats used to reach more distant locations.

Logistics and Techniques

The gathering of edible plants does not require a lot of specialized equipment. For day trips from the village, the major requirement is some sort of container such loosely-woven carrying bags made from grass (called

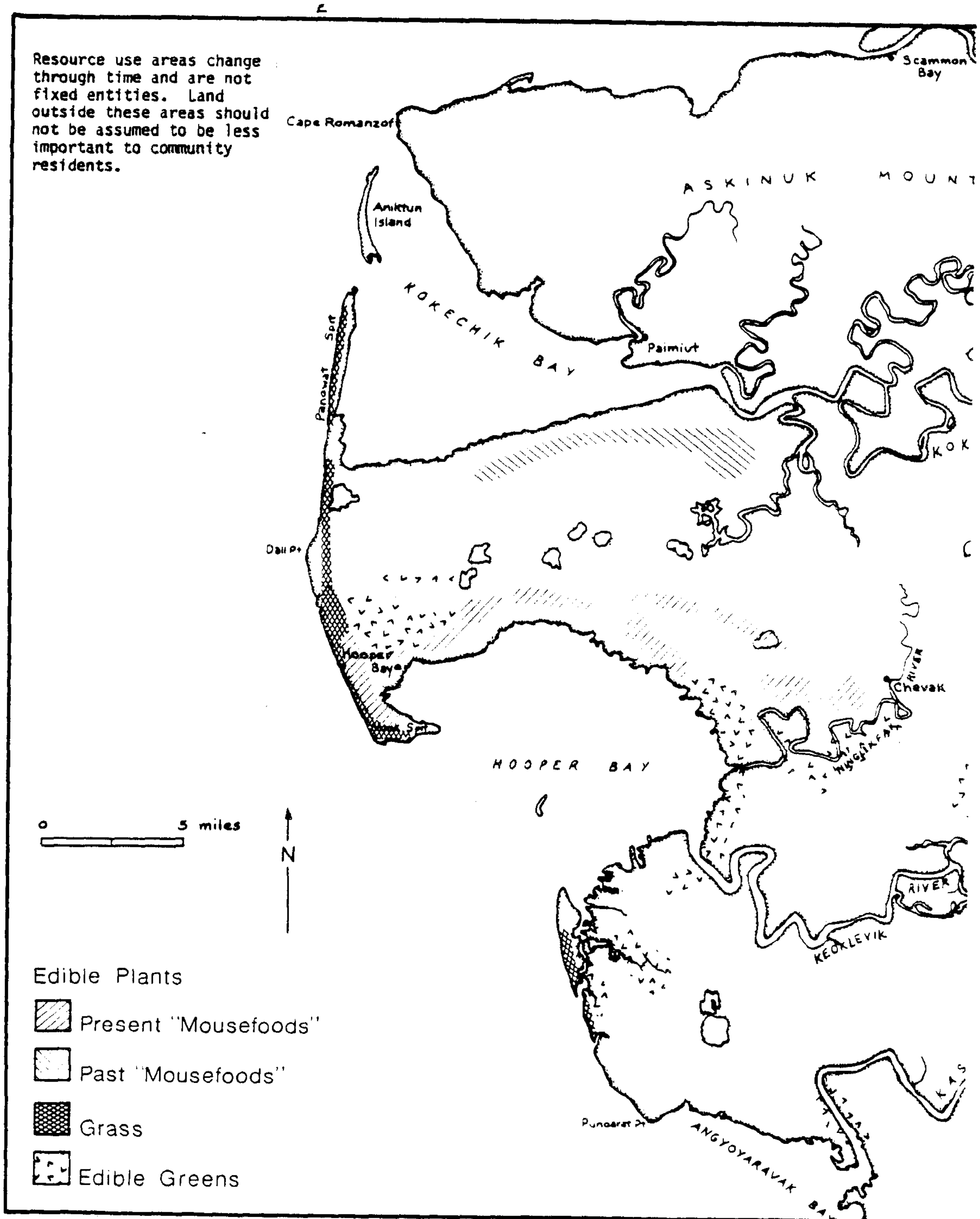


Fig. 16. Plant gathering areas of Hooper Bay residents, c. 1981-1983.

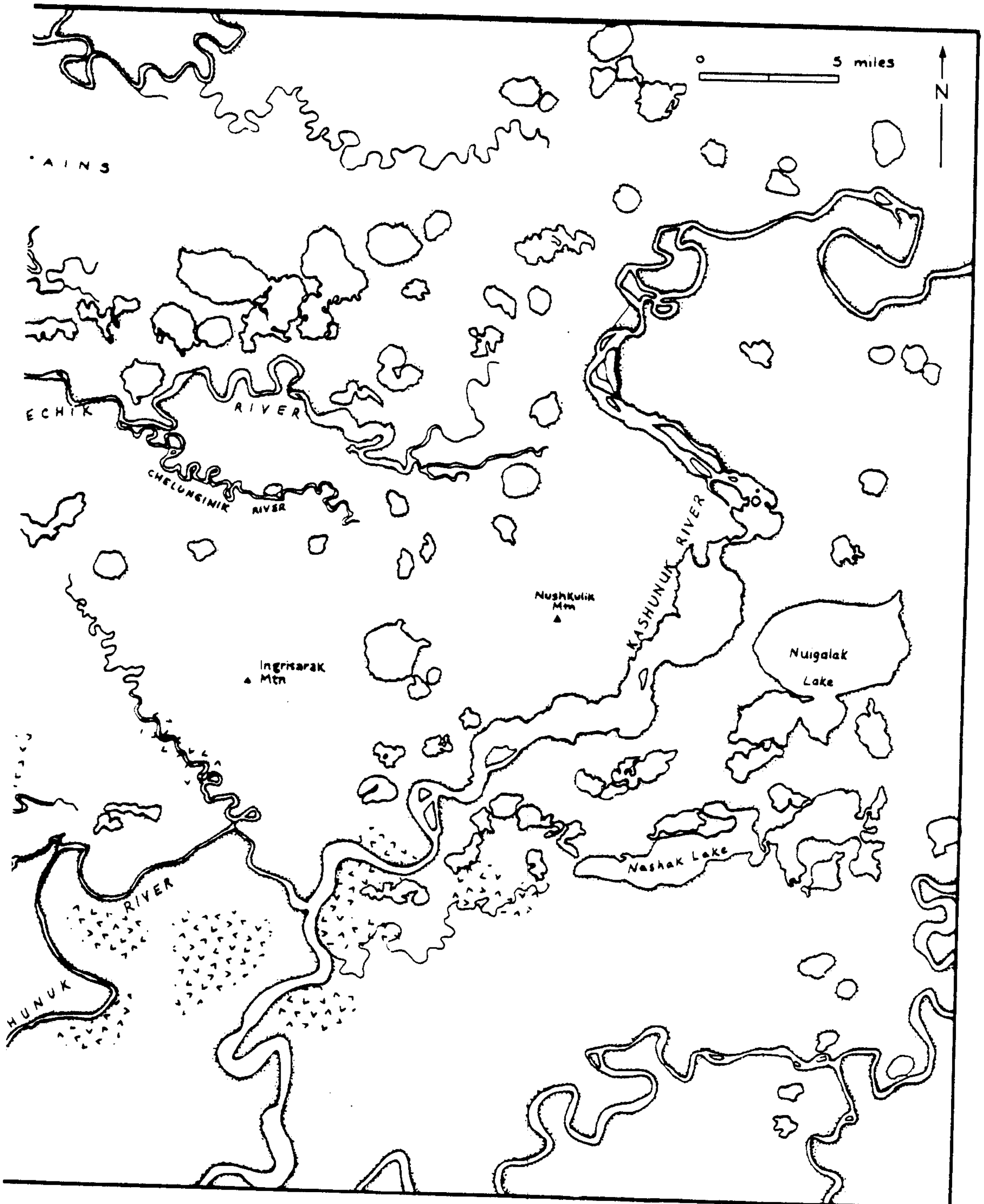


Fig. 16. Continued

issran or *issrateq*), a backpack, or a bucket. Appropriate clothing for the weather is worn and food and drink are taken along. If members of a family decide to go camping, they will take along appropriate gear.

Gathering is done predominantly by women and children, although men might participate in the camping expeditions or on occasional day trips. Persons of all ages gather greens. The very young and the very old participate as long as they are physically able. Young children often get their first exposure to subsistence activities by gathering plants and eggs. These accomplishments are praised and the children made to feel proud about their contributions to the family food supply, no matter how small. Likewise, older female members of the household supply the family with greens at times when other members of the household are occupied with other activities like fishing or fish processing. The size of gathering groups can vary from one individual to several, although small-sized groups of women commonly with children are the norm.

Gathering trips basically radiate out from the village. Women who go out for a few hours may search the immediate outskirts, while those going out all day or overnight may forage the plateau north and east of the village. Most gathering trips do not specialize on just one resource. Usually all types of useful resources that are encountered are gathered. These might include a wide variety of plants, bird eggs, down, and sometimes last year's berries.

If the men take the boats along for a camping trip, they may spend their time gathering greens and eggs, but they might also use the trip as an opportunity to hunt, fish, or gather driftwood. These camping expeditions serve as a time when a variety of resources are harvested, some for immediate consumption while camping, with others to be taken to the

village.

Disposition of Harvest

Edible greens are usually eaten within a short time after they have been harvested. Most are fragile and are difficult to store. Kapuukaraat is eaten with seal oil after the shoots have been boiled. The shoots are made into a type of akutaq after they have been cooked. Allmaruaq also is boiled and eaten with seal oil. Some women store both of these plants by freezing them after they have been boiled, but other women stated they considered the plants less palatable after freezing, so would only eat them when fresh. The Labrador tea (ayuq) is dried after it is gathered and will be used as an additive to store bought tea. Before the introduction of store-bought food, local greens were the only source of vegetable matter in the diet. Plants amendable to preservation were stored in pits or frozen. Store-bought substitutes, usually canned vegetables, are often not as satisfactory according to local residents as the local greens, nor are they as nutritious.

Because greens are readily accessible near the village, individual households supply their own needs. There is limited sharing between households of the raw product, although the cooked products are shared in meals when people are invited. Greens are shared with elder relatives who are unable to go out and gather themselves and may not have household members to gather for them. In general, however, greens are gathered by members of individual households to supplement their own food supply.

In an area where summers and the growing season are short, the availability of edible plants is of limited duration. Hooper Bay residents now have access to store-bought vegetables even in winter, but these are mainly

canned vegetables and are fairly expensive. Store vegetables tend to be viewed as substitutes for local greens which are more highly prized in the diet. As the snow melts and other fish and game resources become available, there is still considerable interest in going out to gather the first greens. As the summer progresses, the intensity of gathering activities decreases somewhat, but the gathering of plants is pursued throughout the summer and up until freeze-up.

DISCUSSION

The return of spring is signalled by several dramatic events. Climatic triggers include rapidly increasing daylight, a warming trend in the ambient temperature and the gradual break-up and erosion of the pack and shorefast ice which has covered the Bering Sea off the Yukon-Kuskokwim coast throughout most normal winters. These factors are joined by the gradual deterioration of the snow covering the tundra and the break-up of ice in the rivers, sloughs, and lakes that dot the coast in this large estuarine area. As the grip of winter is slowly loosened, the Yukon-Kuskokwim Delta coast is host to migrations of a diverse number of wildlife resources.

During average winters, marine mammals are among the first wildlife to be sighted off the coast of Kwigillingok and Hooper Bay. Ringed, spotted and bearded seals have maintained their own association with the pack ice all winter. As that ice breaks and retreats northward, the ringed and bearded seals move north with it. The spotted seals, which were displaced by the ice during the fall, move back into the shallow tidal areas opened up by the deterioration of both the pack and shorefast ice. For a period of several weeks depending on the progression of break-

up, all three species may be found in close proximity to both Kwigillingok and Hooper Bay, making spring the prime time to hunt these animals despite snow and ice conditions which can prove hazardous to hunters and their ability to travel. The walrus migration occurs towards the end of the seals' migratory period. However, the migratory route that brings at least a small number of walrus near Kwigillingok each spring appears to veer northwest above Etolin Strait rejoining the major migratory route (Fay 1981). Walrus are only occasionally harvested by Hooper Bay residents and many local hunters stated that most walrus appeared to pass far out to sea away from Hooper Bay.

Another migratory resource that becomes available during breakup and spring are the migratory waterfowl, shorebird and cranes. The various species of eider ducks winter along the southern edge of the ice pack during the winter and residents of both villages may make limited harvests of these birds from January on depending on the ice conditions. These birds are present in low densities, however, until March when large flocks of common eiders appear off the coast in preparation for their migration to their arctic breeding ground. King eiders follow in April, and like the ice-associated seals, the various eiders migrate north behind the retreating pack ice. As these birds leave, the summer migrant waterfowl, shorebirds and cranes arrive off the coast of Kwigillingok and Hooper Bay, moving inland to nest as soon as the tundra becomes free of snow and melt water.

The reawakening of the tundra not only makes the eggs of myriad bird species available, but it also signals the beginning of the growing season for the local tundra plants. The first plant species collected for food by residents of Hooper Bay and Kwigillingok start sending up shoots as

soon as the margin of ponds become free of ice. As more of the tundra becomes clear of snow, other plants start growing. Many of these plants will be collected for food during the spring, summer and fall.

The spring also signals the return of many fish species, some of which are migratory and others which have remained in the vicinity of the villages, but for various reasons were largely unavailable during the winter. Both Hooper Bay and Kwigillingok have access to herring as they move into inshore waters. Hooper Bay residents have always had herring in the bay, which were harvested for subsistence purposes. Since 1980 they have also been able to participate in a commercial herring-roe fishery in Kokechik Bay north of the village. For Kwigillingok residents, the incidence of herring off the coast of their village is a recent occurrence dating from the mid-1960s; there is no commercial fishery here. However, they long have had access to herring products either by traveling to the Nelson Island area or more commonly through trade with relatives from that area.

Kwigillingok residents are also able to harvest Bering cisco, a small species of whitefish, as they migrate up the rivers and sloughs that drain this section of the coast. Hooper Bay residents have had access to these and other whitefish during the winter as some remain within the local river systems. The whitefish do not stage as dramatic a spring spawning run around Hooper Bay as do the stocks around Kwigillingok.

Despite the potential richness during the spring season, adverse environmental conditions can result in resource failure of one or more resources. Spring is a critical time for residents of both Kwigillingok and Hooper Bay. By breakup, most of their stored food supply of dried and frozen foods has dwindled. Late winter harvests of hares and ptarmigan

provide diversity, but do not contribute much bulk to the food supply. A poor harvest of seals means that only a limited amount of meat, oil, hides and other byproducts will be available to community residents. Many of these seal products have no comparable substitutes. Excessive, persistent snow cover on the tundra may result in a poor nesting season for many species of birds, resulting in fewer eggs being available and reduced number of birds migrating south come fall.

Ice conditions in Hooper Bay have effectively prevented harvest of herring in the past, although this does not appear to be as much of a problem for Kwigillingok residents. However, rainy weather during the period in which the herring are being dried can result in a significant proportion of the harvest being lost due to rot. This is an occasional problem that each village faces.

Spring begins a new annual round for coastal residents such as those living in Hooper Bay and Kwigillingok. The potential resources available at this time are many. However, all are subject to environmental conditions which may vary each year. These conditions, combined with variations within the resources themselves means that each spring will be different in terms of what resources will be available, when, and in what amount. The advent of modern technological advances and stores have made life in the villages somewhat easier and harvesting more efficient, but have not changed the basic environmental conditions and resource variation that coastal residents of the Yukon-Kuskokwim Delta have always faced.

CHAPTER 5

SUMMER

ENVIRONMENTAL CHARACTERISTICS

For the purposes of this presentation, summer refers to the time when snow and ice are finally gone, the chance of frost is well past, and the salmon arrive. Summer is generally the months of June, July and August, but this designation is somewhat arbitrary. In late springs, such as 1982, the snow cover can persist through the end of May, and activities that normally take place in early mid-May may be delayed until June. Also after the snow melts, activities that start in spring grade into summer, such as gathering activities and some fishing and hunting. The mean temperature for May is 40 degrees Fahrenheit. The mean temperature for all three summer months is over 50 degrees Fahrenheit. Daylight reaches its maximum duration of over 19 hours during June (National Oceanic and Atmospheric Administration 1981). Summer is a period of peak productivity for several resources and there are others that are only available during this time.

Salmon pass along the coast mostly bound for the Yukon and Kuskokwim rivers. Waterfowl rear their young on the tundra as do various other wildlife species. The warmth of the summer months fosters the growth of tundra vegetation and the development and ripening of berries. Certain marine fish species move into the shallow inshore areas and into the mouths of tidal streams. The absence of ice facilitates access to clam beds and to various fresh water species of fish. This intense period of local productivity is short-lived, dwindling as fall and colder weather approach.

Resource activities by local residents are also intense during the summer as people seek to maximize their harvests and put up enough food to carry them through winter.

BIOLOGICAL CHARACTERISTICS OF SUMMER SPECIES

Salmon

Salmon are available to residents of these coastal communities primarily during the months of June, July and August as they migrate to spawning grounds. There are five species of salmon present in the region of the Yukon-Kuskokwm Delta. For the residents of Hooper Bay and Kwigillingok, the two most common salmon species are the king salmon (*Oncorhynchus tshawytscha*) and chum salmon (*Oncorhynchus keta*). The other three species occur or are harvested in lesser numbers -- red salmon (*Oncorhynchus nerka*), silver salmon (*Oncorhynchus kisutch*) and pink salmon (*Oncorhynchus gorbuscha*). Each of the species is anadromous spending their adult lives at sea before returning to their natal freshwater streams to spawn (Morrow 1980). After spawning the adults die, ending their particular cycle, and starting yet another.

Neither the Kwigillingok River nor the rivers feeding into Hooper Bay support large runs of salmon, yet for the residents of these coastal communities, salmon has long been a staple of the local economy. Both communities harvest most of their salmon out of the stocks of larger neighboring river systems. Kwigillingok residents traditionally have traveled to the Kuskokwim River to harvest its salmon stocks. Hooper Bay residents harvest Yukon River stocks as they migrate along the coast. Under conditions with onshore winds, the fish move through the bay itself on their

way north. However, when the wind blows offshore, fewer numbers of salmon appear in the bay and the resultant harvest will be poor. Smaller numbers of salmon are available to both villages in or near local streams. Salmon encountered at the mouths of rivers in the vicinity of Kwigillingok do not appear to be spawning there. Some salmon appear to spawn in some of the rivers near Hooper Bay.

Sculpin, Sole and Flounder

In addition to salmon, other fish are harvested during summer by coastal residents. While these fish are year-round residents of the shallow inshore waters, they are only harvested during the ice-free months. There are various species of sculpin (most notably *Megalocottus platcephalus laticeps*), yellowfin sole (*Limanda aspera*), and starry flounder (*Platicthys stellatus*). These fish reside mainly in the shallow inshore areas, ascending the brackish coastal rivers for some distance during the summer months. They usually move out of the rivers prior to freezeup, remaining in deeper tidal areas during the winter where they are not accessible. There are differences in fish availability. The Kwigillingok area appears to have sole but few starry flounder, while Hooper Bay residents harvest predominantly the flounder but few sole.

All of these fish species have white flesh which provides diversity from the red flesh of salmon. Most are considered to be excellent eating, even the sculpins despite their spiny exterior.

Clams

Both Hooper Bay and the coast off of Kwigillingok are the sites of extensive tidal flats which provide suitable habitat for a few species of

clams. The most common species of clams in both locations are the soft-shelled or Ipswich clam (*Mya arenaria* [Linnaeus]). Other clams available in specific locations or occasionally after storms include cockles (*Clinocardium nuttali* [Conrad]), razor clams (*Siliqua patula*), mussels (*Mytilus edulis*) and more rarely, a small species of macoma clam (*Macoma inconspicua* [Broderup and Sowerby]). The local residents also occasionally collect other species of clams from the stomachs of harvested walrus. These and storm carried clams occur as incidentals and do not constitute common local food items. However, when clams or any new or uncommon resource becomes available for whatever reason, it is utilized.

Waterfowl and Other Birds

Waterfowl and various other bird species such as shorebirds, gulls, terns, loons, and cranes remain around the coastal villages during the summer. The eggs will be hatched during June and the young chicks raised until fledged. Waterfowl undergo molt in late July. During this period which may last a few weeks, waterfowl are flightless (Terres 1980). By late August many of the birds that have nested along the coast are starting their migration southward. This southward migration will reach its peak sometime in September. Some birds will remain until October, but by freezeup the summer migrant birds will be gone.

Plants

Summer is the most active season of vegetative growth as plants respond to warm temperatures, long hours of sunlight and the maximal thawing of the upper soil levels. A variety of edible tundra plants are available throughout the summer months and as described for spring, each

has its own chronology and period when it is most edible.

The summer is the period of reproductive activity for the various plants of the tundra and many of these produce berries. Certain berry species are numerous and continue to constitute an important food source for the village. These berries include the "salmonberry" (Rubus chamaemorus L. Cloudberry), the crowberry (Empetrum nigrum L.), and the lowbush cranberry (Vaccinium vitisidaea L.). The latter two species are usually not ripe until fall. Other berry species are not as common, and may only be gathered in small quantities and eaten fresh. These include the nagoon-berry (Rubus arcticus arcticus), blueberry (Vaccinium uligonosum L. subspecies alpinum (Bigel.) Hult.), bearberry (Arctostaphylus alpina), bog cranberry (oxycoccus microcarpus) and bunchberries (Cornus suecica L. or Cornus canadensis x suecica L.). The timing of berry ripening varies slightly each year and in different locales. Berries inland from the coast tend to ripen earlier than those along the coast.

Some berry species grow in most tundra locations. Others are best in certain areas such as inland from the coast or can only be found in discrete habitats. The availability and relative value of each berry to the communities determines the amount of effort people invest in gathering them.

Another plant material available during the summer is driftwood. No trees grow along the coastal fringe of the Yukon-Kuskokwim Delta, yet the coast provides a source of wood in the form of driftwood. The source for this wood is the forested portions of the Yukon and Kuskokwim Rivers. Each spring, as the rotting and fracturing of river ice occurs, ice chunks move downstream scouring the river banks, toppling spruce, cottonwoods, birch and alder. These drifting logs move downstream with the

ice, some depositing along the river banks, others washing out the mouth of the rivers. The amount of driftwood within the rivers varies each year depending on ice action, prevailing currents, and wind direction when the logs exit the mouth.

KWIGILLINGOK SUMMER SUBSISTENCE ACTIVITIES

Salmon

When the salmon arrive in Kuskokwim Bay, fishing activity intensifies in Kwigillingok. Salmon fishing has long been one of the primary activities of the people in this area of the coast. During the early 1900s (circa 1915), Kwigillingok residents left soon after the conclusion of seal hunting and processing for salmon fishcamps on the Kuskokwim River (Drebert 1956). The oldest fish camps were on either side of the mouth of the river near Eek Island. With the advent of outboard motors, probably sometime in the 1930s or 1940s, the fishcamps gradually shifted upriver to the area near the communities of Napakiak and Napaskiak. These fishcamps were largely abandoned in the 1950s and 1960s, although one household still maintains a fishcamp near Napaskiak and there is occasional use of a fishcamp near Napakiak (E. Andrews, pers. comm. 1983). Many men started fishing or working in Bristol Bay canneries starting in the mid-1940s. Occasionally their families went with them, or stayed in the village if they were not able to go to fishcamps upriver. Also, as outboard motors became more powerful and efficient, it became easier for men to travel to the mouth of the Kuskokwim, fish, and return in one day, enabling the other family members to stay in Kwigillingok and process fish in the village.

All five species of salmon are harvested for subsistence use and com-

mercial sale by the residents of Kwigillingok. Five people have limited entry permits to fish in Bristol Bay and there are about 15 active permits for the Kuskokwim River fishery. Some of the young adults go to Bristol Bay and work in canneries.

Location and Timing of Harvest

There are three distinct areas used for harvesting salmon, depending on whether the harvest is for subsistence or commercial purposes. The major area for fishing for subsistence is from the mouth of the Kuskokwim River upriver to the north end of Eek Island and Popok Point (Fig. 17) Men occasionally fish as far upriver as Bethel for subsistence salmon. Another location used for subsistence fishing is near the mouths of the Kwigillingok and Ishkowik rivers (Fig. 17). Usually only the smaller salmon species are caught here, and fewer people use these locations compared to the mouth of the Kuskokwim River where fish runs are considerably stronger.

The third area used for salmon fishing is the commercial fishing district. This area is set by regulation and includes the waters of the Kuskokwim River north of Eek Island (Fig. 17). The mouth of the river where people fish for subsistence purposes is closed to commercial fishing (Alaska Board of Fisheries 1982).

Salmon fishing begins when the king salmon appear at the mouth of the Kuskokwim River, often as early as the middle of May, although fishing usually starts closer to the end of May. By the end of June the chum and red salmon enter the Kuskokwim, and at the end of July the silver salmon appear. Residents process and store most of their winter supply

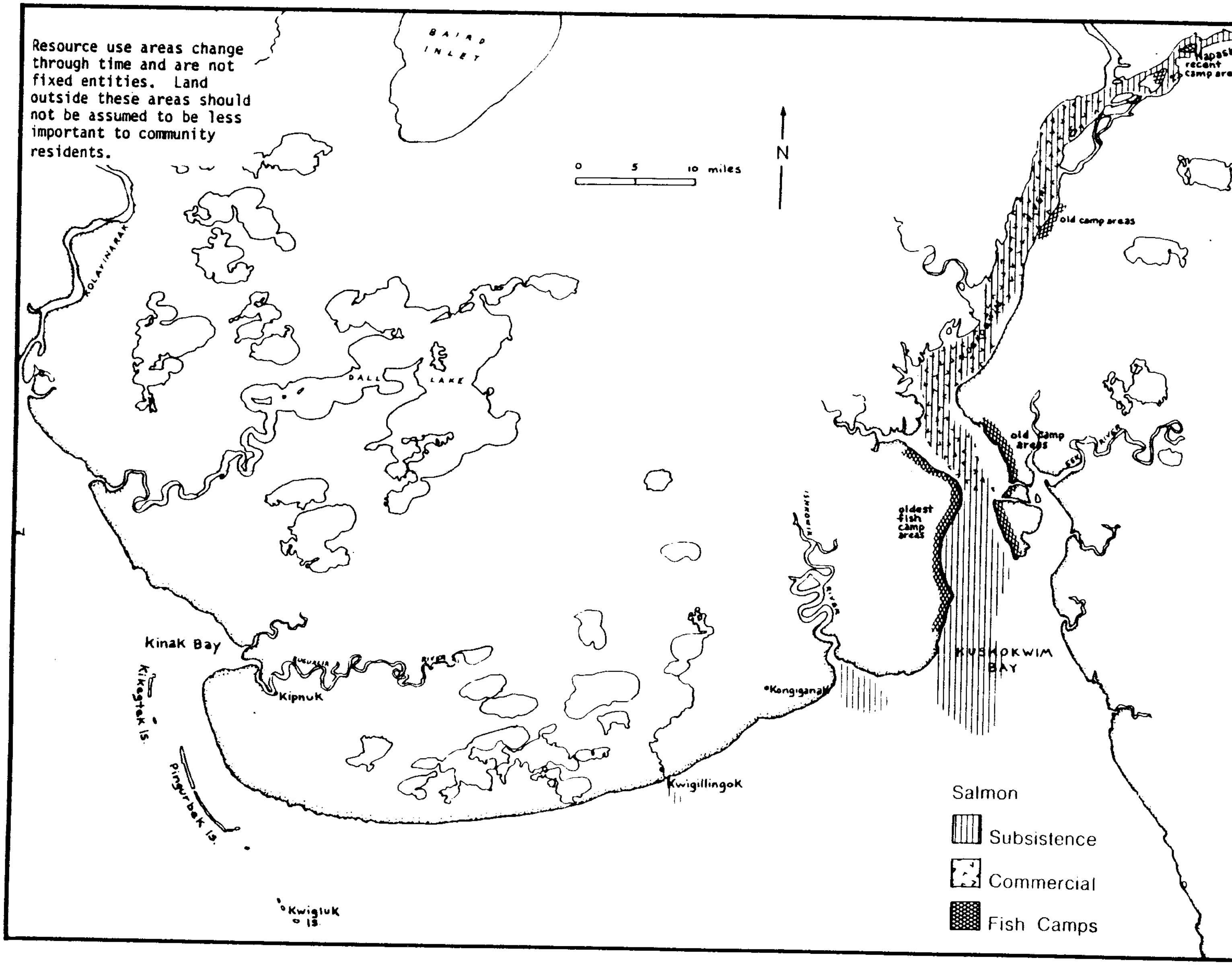


Fig. 17. Salmon fishing areas of Kwigillingok residents, c. 1981-1983.

of dried and smoked salmon in June and July as August is generally a rainy month and the conditions are usually not favorable for drying fish.

Environmental Constraints

The Kuskokwim River provides the residents of Kwigillingok with a stable salmon resource. Although each year sees runs of varying strengths depending on the species, the variation in run strength has more influence on the success and duration of the commercial fishery than it does on the subsistence harvest. Stormy weather may be the major factor impeding the harvest, since men have to travel 20 miles in Kuskokwim Bay to reach the mouth of the river. The timing of king salmon run appears to be influenced by the break-up of river ice. A while an early break-up may mean king salmon are in the river system by the middle of May. The other runs show variations as well in their timing.

Weather considerably effects the processing of the fish. The methods used for preserving the most of the salmon harvest are air drying and light smoking. It is difficult to dry fish when the weather is continually rainy as the fish will have a tendency to mold or rot as well as fostering the growth of maggots. The weather during any particular summer will have an effect on the success of drying with the most favorable conditions being dry, windy and cool.

Logisitics and Techniques

Salmon are usually harvested by using drift gill nets. Since many households fish for commercial sale as well as subsistence use, the

maximum allowed in the commercial fishery. Most fishing households have at least two nets of different mesh size, one for the large king salmon and the other for the smaller species. King salmon nets have a mesh size of 8 or 8 1/2 inches stretch mesh. Nets to harvest the smaller species, principally chum salmon, are 5 1/4 to 6 inch mesh.

Most men use wooden skiffs about 20 feet in length and outboard motors ranging in size from 45 to 200 hp. Additional gear commonly includes tubs to hold the fish, gaff hooks to haul in large king salmon, and extra gas tanks.

Individual households frequently fish for their own salmon, but it is also common for fishing partners to be drawn from separate closely related households in an extended family group. In some circumstances partners for subsistence fishing may also come from separate unrelated households. The male head of the household usually fishes as long as he is still physically active and has not delegated most subsistence pursuits to an older son. Men may fish with sons, brothers, and occasionally with friends. Some men may fish with the same partner throughout the salmon season, while others occasionally may use different partners.

The harvesting patterns for subsistence salmon fishing have shown flexibility during the recent past. Fish camp groups composed of a few related households usually worked as a unit to harvest and process fish. In the past when men traveled to Bristol Bay for fishing and cannery work, members of other households who remained at Kwigillingok fished for the absentee's household as well as themselves. Today, household members may fish for themselves, for a few households in the extended family network, and occasionally for other households which may be distantly related.

As soon as other labor intensive activities, such as herring fishing

and processing, are concluded, the men prepare for salmon fishing and watch for the onset of the salmon run at the mouth of the Kuskokwim River. When the king salmon arrive, initial fishing activity is intense, but the men are careful to space their fishing trips in order to not overburden the processing capabilities of the women who cut the fish. Men leave the village around high tide when water depths in the Kwigillingok River and shallow inshore areas are at or near their maximum, providing a shorter travel route. The best fishing time is right after the turn of the low tide. The incoming tide facilitates the upriver movement of salmon. In order to take advantage of the best tides for traveling and fishing, it is not unusual for men to depart the village during high tide one day, fish overnight during a low tide, and return to the village the following day during the next high tide.

Once the commercial fishing starts, subsistence fishing is prohibited by regulation for 24 hours before, during, and 6 hours after the commercial fishing period, which is normally 6 hours in length (Alaska Board of Fisheries 1982). When the major processors were located in Bethel and only tender boats plied the mouth of the river, it was common for Kwigillingok fishermen to take their commercial harvest 40 to 50 miles upriver to Bethel since they received a better price there. Often they purchased supplies and would fish for subsistence needs on the way home. During the summer of 1983, there was a processor stationed at the mouth of the Johnson River to whom Kwigillingok fishermen sold their catch.

Subsistence fishing ceases when each fisherman harvests the necessary amount of salmon needed for the winter supply. The combined harvest of kings and chums usually numbers in the several hundreds. This number will vary depending on the size of the household and how many other

households share in the fish harvest. The bulk of the harvest will be made up of chum and king salmon; a smaller number of silvers will be harvested during August. The harvest of the other two salmon species is largely incidental to the main harvest.

The commercial fishery harvest is limited by the regulated periods and the guideline harvests established by the Alaska Department of Fish and Game (Alaska Department of Fish and Game 1982). The Kuskokwim River fishery is one of the least lucrative in the state, with an average fisherman earning $2,510 in 1983 and $4,213 in 1982 for the season (Alaska Department of Fish and Game, 1982; 1983). For many households, this is the major source of cash income for the year.

Disposition of Harvest

The majority of the subsistence salmon harvest is air dried and smoked. King salmon are processed in a variety of ways. The heads are removed and the fish gutted. The egg sacs are put in a bucket and saved for drying or eating fresh. The kidneys and liver are also usually saved. The intestines and other organs are discarded. Some kings are filetted by making an incision the length of the fish along either side of the back, and the filets are separated from the skeleton. The filets are then cut off just below the tail and cut into strips, which are brined and hung in the smokehouse. Alternately, filets or "planks" are left attached to the tail and the skeleton cut off just below the tail. Both the sides and the skeleton are prepared for drying by making a series of cuts across the width in such a fashion that meat hangs outward from the cuts when the fish is hung on the racks to dry. These methods are often used for fish that are 25 pounds or less in weight.

For extremely large kings which may range over 50 pounds, the processing is somewhat different. Thse fish are often filetted by making the initial incision along the ventral surface. The skin and meat (generally less than one-inch in thickness) is separated from the carcass starting from the belly and moving up towards the back. The process is repeated on the other side until both sides have been laid out. As a result there is still considerable meat left on the carcass. On either side, a long thick strip of meat is cut from the length of the fish and then a series of horizontal cuts made into the remaining flesh. The skeleton is removed from the sides by making a cut around the dorsal fin. The skeleton remains attached to the tail. The sides form a "blanket" into which a series of horizontal cuts create more surface area to facilitate drying. A couple of willow sticks are threaded through the width of the "blanket" to hold the meat open for drying. Two "blankets" are then tied together at the top and draped over the drying rack, flesh side out. Some women rub the meat of the salmon with the kidneys prior to hanging to prevent the fish from sunburning while they are drying. Other fish, such as chums and red are fileted along the back like the smaller kings to make "planks" and are hung to dry. Only kings are used to make strips.

King salmon heads are frequently cut in half with the gills removed and then packed in containers with rock salt. The heads soften in the salt as they become preserved. They are eaten raw after the curing process is complete, which may take several weeks. Other salmon heads are buried in underground pits for several weeks to ferment. This is a local delicacy and can be done with any species of salmon. Salmon roe is dried and used throughout the year in soups and other dishes.

Salmon may dry for a period of a couple of days for strips to over a

week for blankets. To finish the curing process, the dried fish are smoked, again for a varying amount of time. The men gather driftwood for this purpose. Once the smoking has started, the women keep a smoldering fire going the entire length of time the fish require, sometimes as long as two weeks. When the fish are adequately smoked, they are put into boxes in store houses. Families that have freezers sometimes freeze a portion of their harvest, especially silver salmon, for later use. There are a variety of other ways of preserving smaller numbers of fish, such as curing the meat in salt.

Women process the fish and are responsible for its ultimate disposition. Women occasionally cut the fish individually, but it is more common for them to work in small groups. A woman frequently works with her daughters or sisters from her own or other households. Even though it is most common for women in a processing team to be related to the elder woman directing the activity, sometimes the kin link will be one of marriage. This is often the case if the assisting women's lineal kin live in another village or are not present in the village during salmon season.

Salmon provide a major proportion of the food supply for the people of Kwigillingok. This was also the case during the early missionary period in the early 1920s; that is, the missionaries found themselves in an essentially abandoned village during the summer as most residents moved to camps at the mouth of the Kuskokwim River. The introduction of outboard motors did not change the fishcamp settlement pattern until 1950s and later when the men started going to Bristol Bay to work in canneries. The development of more powerful outboards and a commercial fishery closer to home enabled some families to stay in Kwigillingok during the

summer to harvest salmon for subsistence use and commercial sale. The advent of the Kuskokwim commercial fishery provided an opportunity for some men to earn a cash income close to home using skills they already had. There is as yet no perceived conflict between the two enterprises for Kwigillingok residents. Salmon continues its traditional role of being a major staple of the village economy, and has become a major part of the cash sector of the village economy as well.

Other Fishing

Location and Timing of Harvest

The harvest of sculpin and sole takes place in a very restricted area, from just below the village in the Kwigillingok River extending out to the mouth of the river (Fig. 10). People usually harvest these fish using a beach seine technique in shallow water; the deeper tidal areas offshore are generally not used for harvesting these fish.

Although sculpin and sole are present throughout the summer, their harvest occurs on a sporadic basis. During the early summer when salmon fishing is most intense for both subsistence and commercial uses, these fish are only occasionally harvested. Later, as the household needs for subsistence salmon have been largely met, people begin to fish more often for sculpin and sole and occasionally whitefish. This fishing may be either interspersed between other resource activities or done in conjunction other activities such as clam digging. In August and September, Bering cisco (*Coregonus lauretta*e) begin to move downstream from the spawning grounds. At this time, fishing becomes more frequent, as people try to harvest all three types of fish.

Environmental Constraints

Fishing for sculpin and sole usually occurs on days of fair weather. Because the typical method of harvest is beach seining, it is generally unfeasible to use this method during bad weather especially if there are high winds or a storm from the south.

Fishing is usually most successful at the turn of low tide when the tide is starting to move back in. In order to beach seine, water levels in the lowest portions of the river should be low enough to expose some "beach" instead of the cut bank which is the only surface present at high tide. A relatively flat and sloping mud bank is exposed at lowering tides.

Logistics and Techniques

To harvest these fish, most people use the same net that is used in the spring to harvest whitefish, about 60 feet long with 3 inch mesh. The nets are manipulated from an aluminum skiff or the larger wooden skiff. Additional gear includes sacks, tubs, or buckets to hold the fish.

It is possible for men to beach seine alone. However, the effort is much more efficient if there are at least two people fishing. This activity usually is done by men in the same family and, less commonly by unrelated men who fish as partners.

Beach seining is accomplished by having a person on the bank hold one end of the net. The other end of the net is attached to the boat, which moves out into the channel. The fishermen move the net downstream as a unit. Often the skiff is placed in such a way that the net is crescent-

shaped with a slight bend where the net is tied to the boat. After a few minutes, the skiff is moved downstream ahead of the other end of the net, gradually coming into the bank. The boat is then beached and both fishermen bring the entire length of the net ashore, trapping the fish out of water. The men lay out the net so that the fish are exposed and then start collecting the fish from the net. Generally only fish that are larger than seven inches in length are retained. Smaller fish are released back in the river. This method is repeated as often as necessary to achieve a desired harvest.

It is possible for an individual fisherman to beach seine by placing one end of the net with a small weight on the bank. The boat then is positioned mid-channel and drifts downstream, dragging the weight on the bank. Since the land end of the net does not travel downstream at the same rate as the boat, this method is not as effective as the other method.

Disposition of Harvest

When the fish are brought back to the community, the women of the household do the processing. Sculpins are usually gutted by inserting the thumb just under the throat and pulling downward to the anus and then pulling out the entrails. Soles are gutted using uluaqs as are whitefish. Both sculpin and sole are eaten fresh by boiling. Large harvests will be dried. Sculpins are braided in grass ropes around the gills and hung on racks. To dry soles, a hole or cut is usually made at the base of the tail. The grass braid is passed through this incision. Sculpins are considered to have excellent flesh, but because of their numerous bones and sharp spines, some people prefer not to harvest these fish. Most

families harvest at least a few of these species, and some people harvest large amounts. These fish provide diversity during the summer and an additional source of dried food for the winter.

Clam Digging

Location and Timing of Harvest

Clams remain in the tidal flats off Kwigillingok year-round, but are only accessible for harvest during the ice-free months (Fig. 18). Clams are dug only after the mud of the tidal flats becomes unfrozen. There may be some harvest in May depending on how soon the mud becomes unfrozen, but most of the clam harvest takes place from June through September.

The soft-shelled clams are most commonly harvested, being the most abundant and accessible. At the mouth of the Kwigillingok River they are found in the adjoining tidal flats on either side at low tide. Most people tend to dig them on the flats west of the river, even though they are also present on the other side. Another area where they can be found is the in-shore side of the sandbar islands near Kipnuk west of Kwigillingok. This area is less commonly used because of its distance from village. It was also stated that soft-shelled clams with black shells occurred in inland areas, but these inland clams were inedible.

Cockles are found in the tidal flats located further offshore. These areas are exposed at extreme low tides, making them less likely to be harvested on a regular basis. Boat transportation from the village is more difficult under these conditions. Razor clams are located on the floor of the submerged river mouth itself. These are usually not accessible. People are more likely to get razor clams when they are found in the

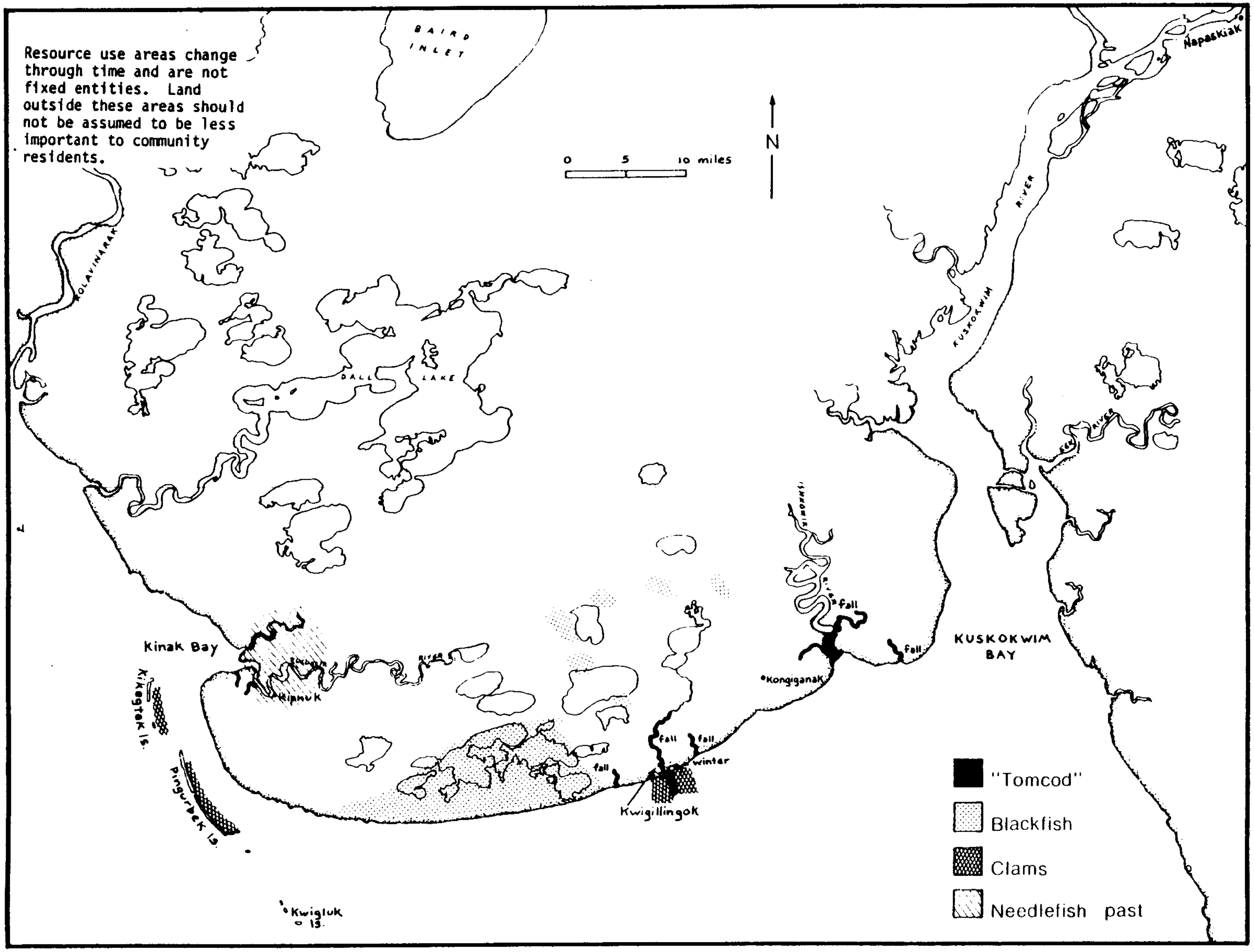


Fig. 18. Tomcod, blackfish, clam and needlefish areas of Kwigillingok residents, c. 1981-1983.

stomachs of walrus. Occasionally, mussels are found in the shallow tidal areas. These usually come in with floating kelp and are not present in the mud themselves. When encountered, they are harvested. The inconspicuous macoma clam is seen rarely when digging in the flats and probably occurs at extremely low densities.

Environmental Constraints

The major environmental factors influencing the harvest of clams includes the accessibility of the tidal flats and the location of the clams themselves. Because of ice, the tidal flats are only exposed for a few months out of every year. Even after the ice is gone, there is a certain amount of time involved before the mud itself becomes unfrozen enough to make digging feasible.

The location of the different clams themselves make them present in the general vicinity of Kwigillingok, but not necessarily readily accessible. The soft-shelled clam is not only the most abundant clam, but it is also the one that is most easily harvested. The other species either lie in beds that are rarely or seldomly exposed or are attached to a substrate such as kelp that is not prolific along this section of the coast.

Logistics and Techniques

Clams are dug by hand or with small spades at low tide. There are very few gear requirements for harvesting clams other than boat transportation to get to the tidal flats and a spade if desired. Buckets are taken along to hold the clams. Clams are dug by both men and women.

People may go out individually, but usually they go out with someone

else. Their partner for this endeavor is most likely someone from the same household. Partnerships for this endeavor may change for each outing and are not necessarily stable.

Clam digging may be done on its own or may be done in conjunction with fishing for sculpin and yellow fin sole. Clams are usually harvested on an as-needed basis and digging is interspersed between other activities such as salmon fishing.

Disposition of Harvest

Clams are usually retained by the harvesting household, and enough are harvested for a few days supply. Clams are usually eaten raw. Some people may freeze small quantities for the winter. They are generally a minor item of the annual diet, but do provide diversity and a different type of food during the summer.

Waterfowl and Bird Hunting

Very little hunting of waterfowl takes place during the summer around Kwigillingok and is largely opportunistic in nature. The important labor intensive activity of salmon fishing for both subsistence and commercial uses occupies much of the summer. Nesting birds are potentially accessible during summer, but by and large Kwigillingok residents do not choose to hunt them at this time. The nesting density of waterfowl is less than that around the Hooper Bay area, which may also be the case with other prey species such as loons, cranes and shorebirds. The peak availability of birds in this area coincides with the spring and fall migrations and most hunting takes place during these times.

Plant, Berry, and Wood Gathering

Location and Timing of Harvest

The gathering of edible plants continues through summer although the plants gathered at this time are different from those taken during spring. Major plants gathered during the summer include cowslip (allngiguaq), sourdock (qaugciq, *Rumex arcticus*), Labrador tea (ayuq, *Ledum palustre*) and stink-weed (caiggluk, *Artemesia tilesii*). A more detailed listing of edible plants gathered by Kwigillingok residents is given in appendix C. Summer plants are gathered in the same general location as noted in Chapter 4 (Fig. 11).

The late summer sees the first ripening of the several varieties of berries which dot the tundra. Although many of the species do not fully ripen until September, the ripening of the salmonberry (naunraq, "cloud-berry") is eagerly anticipated by the residents of Kwigillingok. In August, many families go out from the village to pick salmonberries, often camping overnight. The other berry that usually ripens at this time is the nagoonberry (puyuraaq), but these berries only grow in limited quantities and are not found in many locations.

The harvest of salmonberries takes place all along the coastal plain around Kwigillingok. Principal areas are the local river and associated sloughs, the upriver portions of the Ishkowik River, the lake country to the west of the village, and a few coastal areas (Fig. 19). Families that go upriver to fishcamp each summer gather salmonberries near Napaskiak and other areas along the east shore of the Kuskokwim (Fig. 19).

Salmonberries generally ripen by the first week of August, but, depending on the conditions of any particular summer, they may ripen as

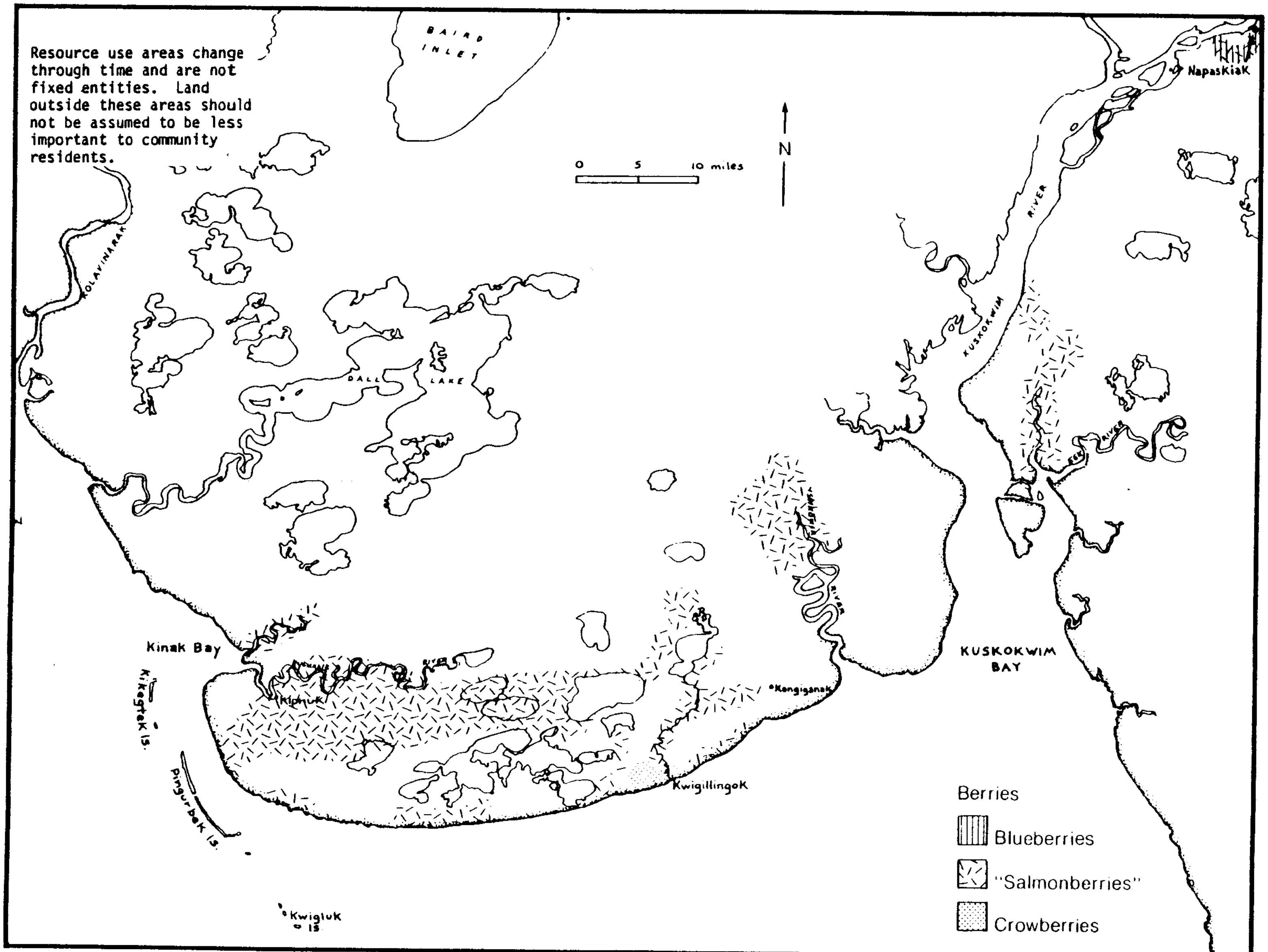


Fig. 19. Berry picking areas of Kwigillingok residents, c. 1981-1983.

early as the middle of July until the end of August. There tends to be an east to west progression in the ripening of salmonberries. Those near the Kuskokwim River tend to ripen earliest, while those around the Kipnuk area west of Kwigillingok ripen at a later time. It is not uncommon for women to travel to visit relatives at Tuntutuliak and begin picking berries before they are ripe around Kwigillingok. Some women occasionally go to Kipnuk to continue picking berries in that area after the berries in the Kwigillingok area have passed their peak.

The forested portions of the Kuskokwim are the source of wood for the residents of Kwigillingok. Each year during spring break-up, trees such as spruce, cottonwood, birch and alder are toppled into the river, eventually drifting out to sea. Drifting logs are deposited along the river banks, the shores of the bay, and the coast, depending on currents and winds. Drift wood has long been a prime source material for the villages along the lower Kuskokwim. Historically, driftwood provided building materials for the sod houses, boat frames, tools, utensils, drying racks, and heat. Driftwood is still actively gathered by the residents of Kwigillingok for a variety of purposes.

During the summer, driftwood is gathered along the west bank of the Kuskokwim River from its mouth to several miles upriver (Fig. 20). Jutting points such as Popok Point are especially prime areas to search since the deposition of driftwood is apt to be greatest there. Other areas searched extend from the mouth of the river all along the coast to the area near Pingurbek Island (Fig. 20). The amount of driftwood found along this section of the coast is dependent on deposition after the wood has left the river. People gather driftwood from late spring until freeze-up. During the summer, men search for wood whenever it is needed.

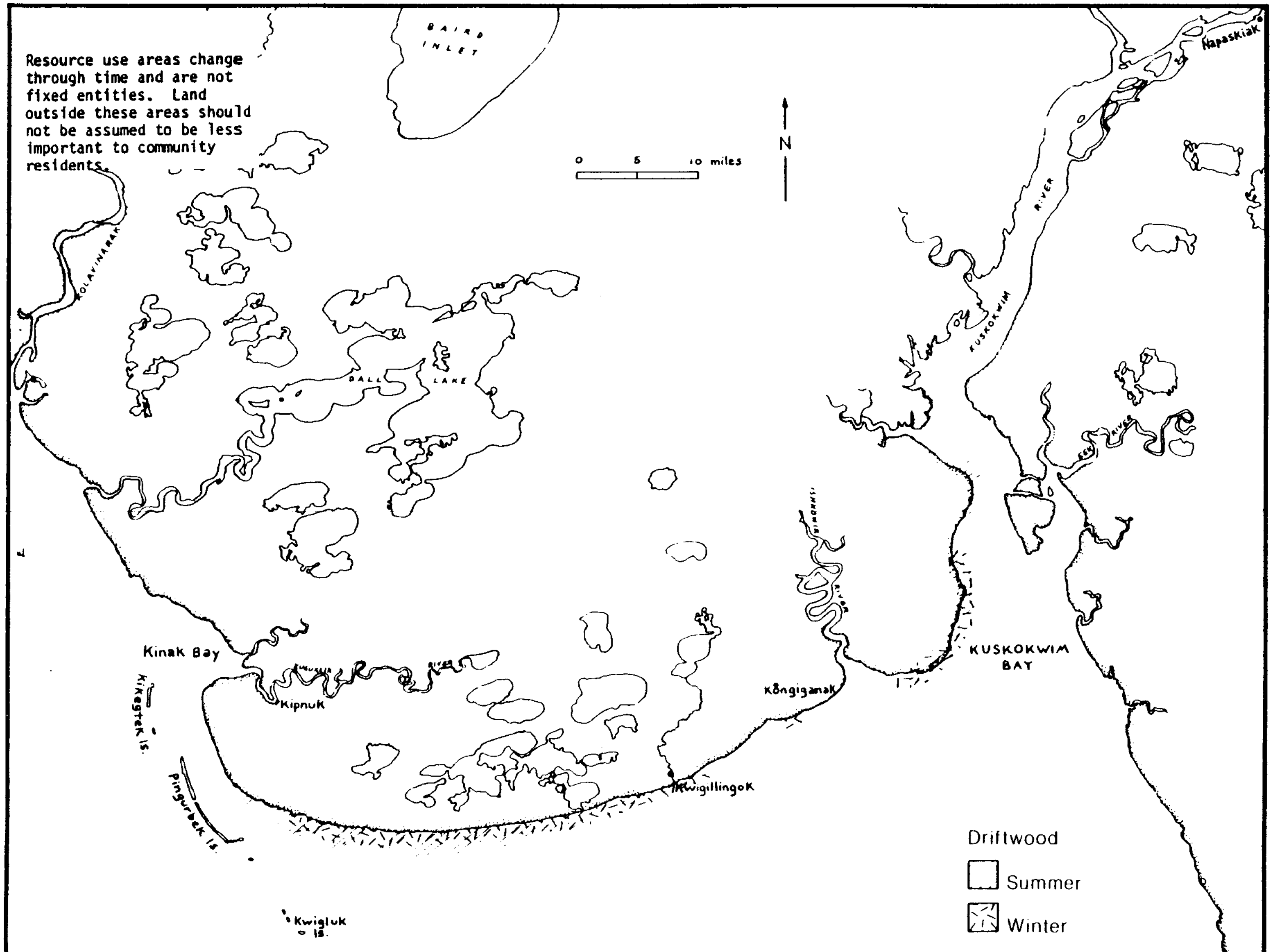


Fig. 20. Driftwood gathering areas of Kwigillingok residents, c. 1981-1983.

Wood gathering is done on its own or in conjunction with some other activities. Some men who fish commercially often bring driftwood back when they return from the Kuskokwim River.

Environmental Constraints

Weather conditions during the summer determine the abundance of berries. Cool, rainy weather usually produces fewer salmonberries than summers with generally fair, warm weather. During cool summers, the berries also tend to ripen later than they do during warm summers. During summers of poor salmonberry availability, it is necessary for people to make more trips and search several locations in order to gather enough berries.

As previously mentioned, the availability of driftwood varies each year depending on the action of the ice at break-up in the forested portions of the Kuskokwim River. Gathering wood in the river requires conditions safe for boat travel, especially since the boat will be heavy laden when it returns. Tides affect the timing of driftwood gathering along the coast, since the tidal flats are so extensive in this area that high tide and the resultant higher water levels are necessary to travel close to the coastline itself.

Logistics and Techniques

The requirements for berry picking are few. Berries can be picked on walking excursions out from the village. More frequently gatherers travel by skiff to a chosen location and then gather berries on foot. Canoes are used by some families in order to pick berries around some of the nearby lakes. Some form of container is taken by each gatherer to hold their

collected berries, such as buckets.

Berry gatherers are principally women, although children are taken along and sometimes men will participate, especially on the overnight trips. Women of all ages participate as long as they are still physically active. Although women may go out individually, usually they go with other women. Whole families may go on short overnight trips to pick berries. These trips usually last two to three days, and rarely more than one week. The gathering of berries allows women to get out of the village after the intensive period of salmon processing.

Very little gear is required to gather driftwood other than a boat for transportation and a saw (often a chainsaw) and/or an ax. Wood is cut into lengths that can be easily transported in the boat back to the village. The logs are cut into smaller lengths in the village, usually with a chainsaw.

Wood gatherers are individuals or small groups of men. Although it is common for individual households to take care of their own wood needs, fathers, sons, or brothers and occasionally non-relatives living in separate households cooperate to put up a common supply of wood. Heads of households are often responsible for gathering wood. The task may be delegated to older sons who are capable of operating the family's skiff. Relatives sometimes help supply the wood needs of households that are unable to get their own.

Disposition of Harvest

The principal use of salmonberries and nagoonberries is as a prime ingredient in akutaq. Akutaq is often served as a dessert, a snack with hot beverages and as a treat during holidays, religious periods, and when rela-

tives visit from other villages. Akutaq is one of the most prized prepared foods in the village diet. Currently, berries are preserved by freezing. In the past they were stored in barrels or in pits.

Wood is used to build and repair drying racks, to smoke salmon after they have been dried, and to provide fuel for steambaths. Since there is no running water in village homes, people bathe by taking sponge baths or steambaths. Steambaths are preferred as they are more effective and more enjoyable. Family members and/or friends usually take steambaths together. The baths become opportunities for social exchange as well as a means of bathing.

Substantial quantities of wood are required during summer to dry fish, because a rack of fish is frequently smoked for several weeks. Cold, smoldering fires must be kept going continually in the smokehouse until the fish are cured. If it is raining after the fish are smoked, a small fire may be kept going so the fish will not rehydrate.

HOOPER BAY SUMMER SUBSISTENCE ACTIVITIES

Salmon Fishing

Location and Timing of Harvest

Although many types of activities take place in early June in and around Hooper Bay once the salmon arrive in the bay, all other activities decrease in intensity. A multitude of nets are set out in the near tidal waters of the bay, and the racks lining the bank of Napayaraq River are rapidly filled with salmon. The river front is a center of activity as boats come and go at high tides and women cut fish. There is only subsistence fishing of salmon in Hooper Bay, since there is no commercial fishery.

The salmon are present in the bay between early June through July. The major salmon species in the bay at this time are chum salmon with king salmon usually second in numbers. Pink salmon and silver also come into the bay, but are less common than the other two species.

Most nets are set on the tidal flats inshore of Nuok Spit and just east of the channel of Napayaraq Slough (Fig 15). Salmon are present in other ares of the bay, but people fish in this area which is close to the village, making it more convenient to check nets when the tide is high.

Environmental Constraints

The majority of fish coming into Hooper Bay appear to be Yukon River stocks (M. Geiger, pers. comm. 1983). Residents noted that a limited number of the salmon (usally pink salmon) turn up the local rivers to spawn. The appearance of salmon in Hooper Bay takes place during the salmon migration to the Yukon River. A number of environmental factors can influence the strength of the run into the bay. Wind direction appears to be the major determinant affecting salmon presence or absence in the bay. A northeast, offshore wind tends to keep salmon away from Hooper Bay, resulting in a diminished salmon harvest. One elder fisherman noted that when the wind is from the northeast the salmon can "smell the Yukon" and head on up the coast without coming into the bay. An offshore wind may influence the sea currents away from land, resulting in the salmon migrational route being further out to sea.

Conversely, an onshore wind from a westerly direction tends to shift the migration route closer to shore. In particular, respondents noted that a southwest wind will drive the fish right into the bay. Years with prevailing onshore winds are usually years of good salmon

harvests.

Another variable affecting salmon abundance is the timing of break-up at the mouth of the Yukon River. If there is a late break-up so that there is still some ice at the mouth in late May-early June, the kings delay their entry into the river. When this occurs coincidentally with prevailing southwest winds, Hooper Bay residents have more king salmon available to harvest than usual (M. Geiger pers. comm. 1983). One fisherman noted that a prevailing wind from the northwest during winter is usually a sign that there will be a good fishing season that summer.

Tides also influence daily harvests. Because of the shallowness of the bay, nets only can be set and picked around the high tides. The movement of salmon into the bay tends to be heaviest when the tide is coming in.

Logistics and Techniques

Most people use homemade wooden skiffs from 20 to 24 feet in length to set nets for salmon. Fishermen set one or more nets varying in size from 30 to 300 feet although most people interviewed stated that their nets were either 50 to 60 feet or 100 feet long. Most nets have 5 1/2 to 6 inches stretched mesh. These nets can catch any of the salmon species present in the bay, although the mesh size targets on the smaller species. Some people also use nets with larger than 6 inch mesh used for targeting king salmon. Since king and chums appear in the bay at about the same time, nets of different mesh sizes are set simultaneously. Nets are checked at least once a day and more often if the fish are running heavily.

Men usually set and check nets, although young women in some families

help check the nets occasionally. Once salmon fishing begins the women of the household usually spend their days cutting and processing the fish. In households which include both elder and younger men, the younger men tend to be responsible for the day-to-day checking of the nets. The elder men guide the activity and are involved in the placement and setting of the nets. Nets are set perpendicular to shore. Salmon picked from the net are taken back to the river bank either just below the main knoll or to the few fish camps farther up the river. Once a rack is filled with drying fish, people often let other relatives who need more fish check their nets for awhile.

During the processing of fish, women from their mid-teens to over 60 years of age cut fish if they are physically able. Younger women usually cut the smaller salmon species, the bulk of the harvest. Older women generally cut the kings, which are considered to require more specialized skills. Usually the rack which each household group uses is their measure of their salmon requirements. Some groups have a rack large enough so that once it is filled, they have the amount of fish they need for the winter; others fill their rack two or more times until they reach the required amount.

The nets catch starry flounders (uuraruq) in addition to salmon. These fish are caught because the nets are placed in shallow tidal areas. Flounders greater than six inches in length are usually retained and dried. Smaller flounders are thrown back into the water.

Disposition of Harvest

Small salmon (chum, silver and pink) are processed the same way. When the men bring the fish back into town, they are unloaded at the

fish-cutting site. If the fish are brought back at night, they are covered by a tarp and planks overnight to keep them cool and protect them from dogs and birds. The women process them during the day.

Most women process fish sitting on the ground or sitting on small driftwood stumps. Using an uluaq, the women cut off the head of the fish, then gut them. Next each side of the fish is filleted off the backbone and ribs. The skeleton is severed just below the tail. The women make a series of deep cuts across the width of the flesh; these cuts cause the meat to hang outward and facilitate its drying more quickly. The fish halves, still attached by the tail, are washed and hung on the rack, flesh side out. Egg sacks are air dried or eaten fresh in soups. Some fish heads are put in pits which may be lined with grass and covered to ferment for several weeks. Other organs are usually discarded.

After the fish have dried for a period that may last a couple of weeks depending on the weather, the fish are smoked in a storehouse. The fish are hung from high racks and a cool smouldering fire built in a kind of open stove below. The stove is covered with a piece of metal, which diffuses the smoke over a wider area resulting in a cold smoke. Fish may be smoked for a couple of weeks in this fashion until they are cured. Some of the dried fish are placed in containers with seal oil as the preservation agent. Fish preserved in this manner are not subject to mold, a common problem with box-stored dried fish under humid conditions.

King salmon are less numerous than the aggregate of the small salmon species. Because of their large size, they are cut by the older women who are considered most skilled. They are cut and dried in a similar fashion to chum salmon. After they are smoked, they are put in seal pokes or other containers with seal oil for further preservation. A portion of a

family's king salmon harvest may be preserved in salt after the fish have been cut, and those families with freezers may freeze a portion. King salmon heads are not fermented in pits.

Dried salmon is one of the most common foods eaten by Hooper Bay families during the year. In the summer while the fish are running, they are eaten fresh, boiled in soups, baked, or fried. The predominent way of eating salmon is as dried fish. It forms the basis of many meals typically accompanied by seal oil, pilot bread crackers, bread, tea, and coffee. When soups are served, dried fish is also placed on the table. Light weight and nutritious, dried fish is the major food taken for consumption during seal hunting, winter fishing, and on other outdoor pursuits away from the village. The natural oil in salmon makes dried fish a good source of fat and energy.

Salmon provide one of the greatest sources of food in terms of weight. Household groups with active fishermen and cutters process on an average from several hundred fish to a thousand fish each summer. The fish harvested during the summer are expected to last throughout the winter until the seals come again, supplemented with other resources during the summer, fall, and winter.

Other Fishing

Besides the salmon and herring which migrate near Hooper Bay in the late spring and early summer, there is a wide variety of other fish species available to Hooper Bay residents. Many of these species remain in the area on a year-round basis; others make short periodic migrations which make them seasonally unavailable. During the early summer some of these fish are caught incidentally with the salmon and herring; at other

times they are the target species. The non-salmonid species of fish available to Hooper Bay residents fall into three categories. The marine resident species include the starry flounder, various species of sculpin (kayurlugaq, "devil fish"), plus some other bottomfish species. The freshwater species include blackfish (cangiiq, Dellia pectoralis), least cisco, pike (cukvak, Esox lucius) and nine-spine stickleback (quarruuk, Pungitius pungitius, "needlefish"), among others. The anadromous species are the Bering cisco (naptaq), saffron cod (iigalluaq, Microgadus proximus, "tomcod"), and humpback whitefish.

Location and Timing of Harvest

During the early summer some limited harvesting of the marine species (starry flounder, sculpin, cisco) occurs. The harvest is largely incidental to the targeted harvest of salmon and herring, the major focus of subsistence fish harvests during the first half of the summer. As household members go out to make their camps for berry picking in August, the emphasis changes. While at camp, people set nets at or nearby their camp with the intent of harvesting enough stream fish to provide for their immediate food needs (Fig. 21). Depending on the location, these nets harvest Bering cisco, least cisco, sheefish, humpback whitefish, pike and spawning salmon. Probably more cisco are caught than other species. Some families also set blackfish traps while at camp or harvest a limited amount of "needlefish" with dipnets or grasses.

After returning to the village from berry camps in late August, men start fishing for sculpin, flounder, tomcod, and some Bering cisco. The men usually fish just inshore of Nuok Spit for sculpin and flounder (Fig. 15). If they go to other locations within the bay to hunt for seal and

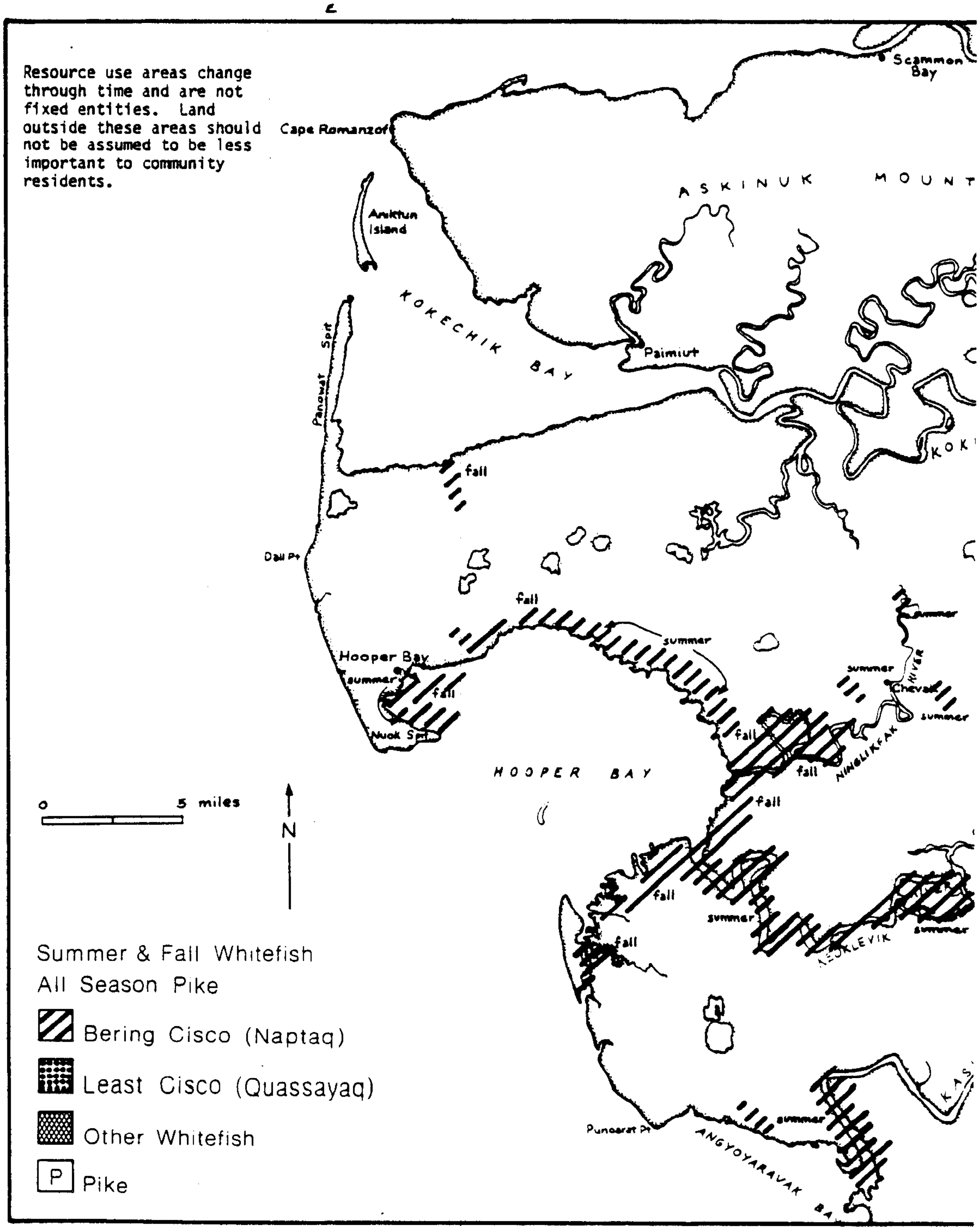


Fig. 21. Summer and fall whitefish, and all season pike areas of Hooper Bay residents, c. 1981-1983.

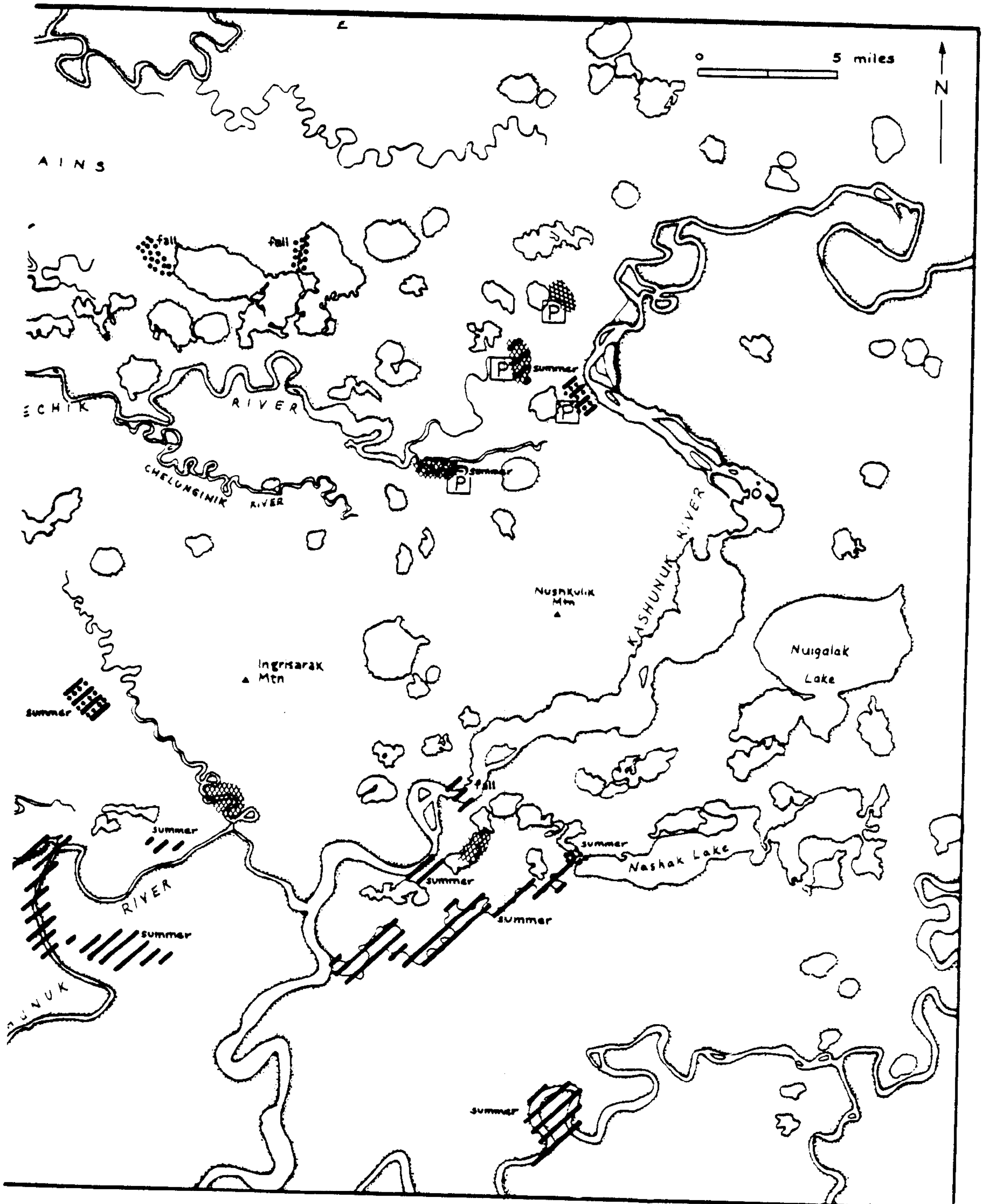


Fig. 21. Continued.

waterfowl, they may set nets near the mouth of the Keoklivik River and other locations (Fig. 15). These nets usually harvest tomcod, cisco and sculpin. Fishing in the bay continues until freeze-up. Late in September fishing for tomcod moves into local streams.

Environmental Constraints

Besides climatic conditions which would hamper the activities of the fishermen themselves, the seasonal movements of the fish themselves affect their harvest and local abundance. Flounders tend to move inshore to shallow and estuarine waters during summer, moving out to deeper water in the winter. The Bering and least ciscos are locally common, but due to seasonal migrations, may not be available at some areas where they can be harvested at other times of the year (Morrow 1980). Sheefish and burbot ("lush") are not locally common, but at certain times of the year their migratory routes bring them close to Hooper Bay.

Logistics and Techniques

The basic gear needed for the summer harvest of most of these species is a net with a relatively small mesh. Many households have 60-foot nets for this purpose; others deploy smaller nets. The common mesh size is three inches, with a range from 2-1/2 to 4 inches. Nets are set or drifted from a boat in the bay and are set at berry camps. Boats are used to set, check, and drift the nets. Either the large wooden skiffs or the smaller aluminum boats may be deployed for this purpose. For the harvesting of needlefish at berry camp, either a dipnet with fine mesh or tied bundles of grasses are used.

Fishing with nets is done by men occasionally accompanied by women.

It is an activity conducted by members of a single household, with father, son, and brother combinations most common. Usually at least two men are involved with fishing although in certain cases a single man checks a set net.

Nets are set at high tide inshore of Nuok Spit which facilitates boat access from the village. They may be checked at other times. Drifting is also done at high tide. Men leave the village as the tide is going out, and select a location to wait through the low tide and drift as the tide and flounders come in. When nets are set at berry camp, they are checked as necessary. When fishing is carried out during a hunting trip, men set a net only for a few hours, pulling it just before they return home.

Disposition of Harvest

The harvested fish is turned over to the women for processing and preparation. Certain fish such as the sculpin and whitefish taken in the bay are eaten fresh, usually boiled, although they may be dried. Flounder are usually dried. Some people stated that they preferred not to harvest summmer whitefish in the bay because the flesh is too soft at this time. Fish such as cisco, pike, blackfish, and needlefish harvested at berry camp usually are eaten fresh, usually after boiling. Families only harvest enough for their immediate food needs.

The local fish species are a less obvious component of the Hooper Bay food supply than are salmon and herring, but play an important role in the community's economy. During the summer they are harvested with less intensity than salmon. As the summer wanes, the harvest of many of these fish, including tomcod, begins to intensify until freeze-up. In addition to the large harvests of salmon and herring, the residents of Hooper Bay

appreciate eating these other types of fresh fish and storing some for the winter, either dried or frozen, to provide diversity in the diet.

Clam Digging

Location and Timing of Harvest

Hooper Bay is a large tidal bay with extensive mudflats providing suitable habitat for soft-shelled clams. As soon as the clam beds are free of ice in the late spring until freeze-up in fall, the clams can be harvested. Most people harvest clams from June through mid-September. The tidal flats throughout the bay as well as those surrounding a small island in the southern portion of the bay are potential harvest sites. The majority of harvest probably takes place close to the village for efficiency of harvest and ease of access. As soon as the bay is free of ice and the tidal flats are unfrozen, some people go clamming often using a snowmachine as transportation to the mouth of the Napayaraq River. Most clam diggers go by boat and are most likely to use the tidal flats at the mouths of the myriad of streams and rivers draining into Hooper Bay, especially the Napayaraq River (Fig. 22). To harvest cockles, it is necessary to go outside the bay at the southern entrance and dig along the tidal bars south to Punoarat Point north of the mouth of the Kashunak River (Fig. 22). The incidence of cockles is presently low in the bay itself.

Clams are only accessible during ice-free months. Even after the ice has moved out of the bay, the tidal flats may remain frozen for a while, making it extremely difficult to harvest clams. Therefore, most harvests of soft-shelled clams and cockles take place in the summer when everything

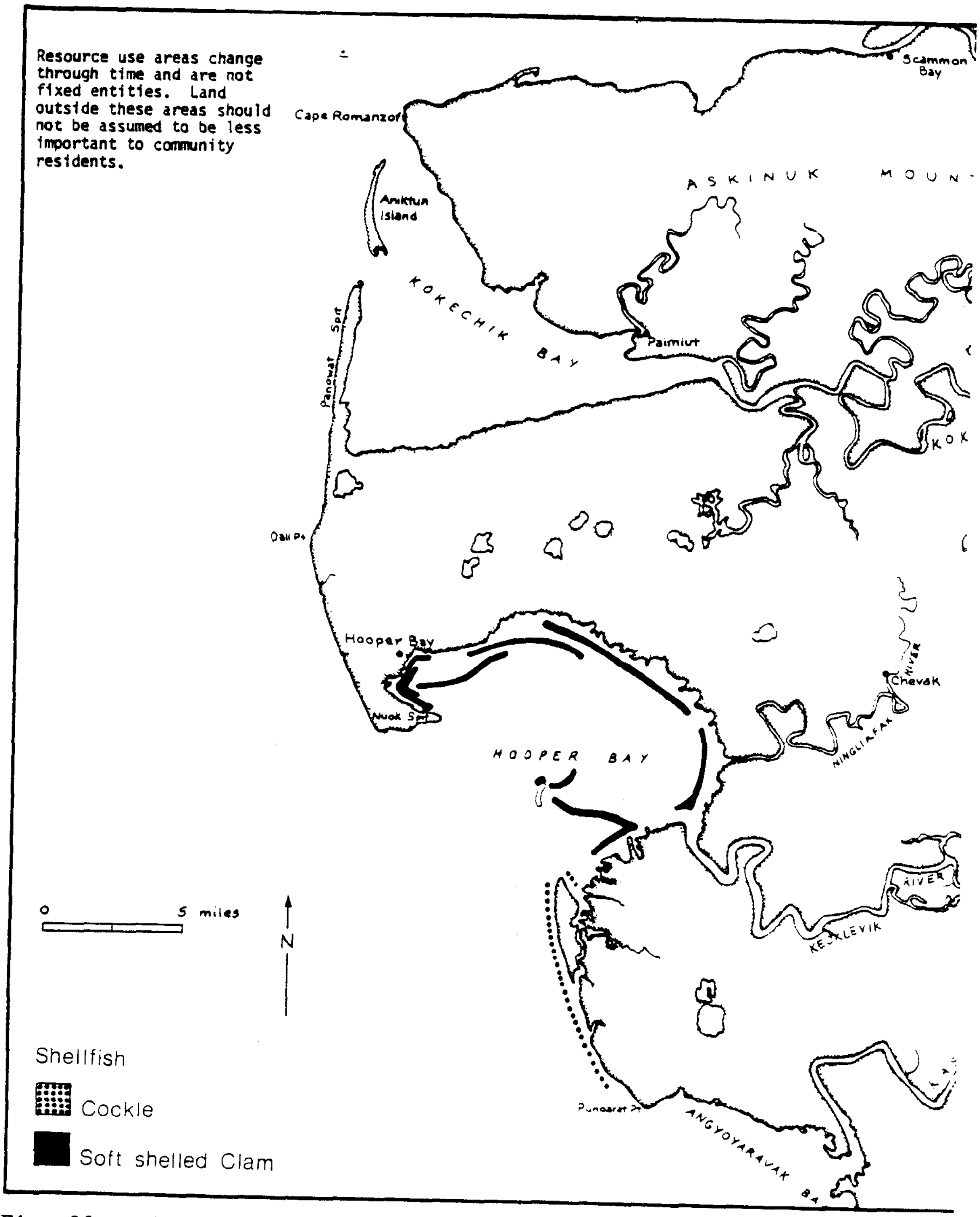


Fig. 22. Clam digging areas of Hooper Bay residents, c. 1981-1983.

is thawed out. The harvest of clams is also dependent on the tides, as the flats are only uncovered during low tide. People going by boat usually leave the village well before low tide, go to the location where they plan to dig, and then wait for low tide to expose the clam beds.

Older informants stated that there used to be cockles in the bay in the past. During one winter there was a storm surge which moved ice inland and scoured the shallow bottom of the bay. The following summer residents noticed that there were few cockles. This species of clam lives close to the surface of mudflats (R. Baxter, pers. comm. 1983). The top layer of mud may have been destroyed by ice action during the storm surge, resulting in the extirpation of this species of clam from the bay. Soft-shelled clams tend to reside deeper in the mud and so were less affected.

Logistics and Techniques

Clam digging requires little equipment. Most people dig clams by hand, storing them in buckets. Some people use small shovels. Transportation used to support this activity is variable. While there is still snow on the land, some people use snowmachines as transportation. Most people use some sort of water transportation, including wooden and aluminum skiffs and qayaq. These are used mainly as transportation to a clam site, whereupon the digger goes by foot during the low tide.

Clam diggers are most likely to be the younger men and women in a household, ranging in age from late-adolescence to young adulthood. Elder household members do not usually participate in clam digging. Middle aged household heads may participate until they have older teen-aged children who usually take over the activity. Both males and females

participate in the activity. Clam diggers occasionally go out singly if traveling by snowmachine, but usually go out in groups of two or three. Clam diggers are most likely to be siblings or first cousins.

Clam digging must be done at low tide when the mudflats are exposed. The diggers walk along the flats looking for siphon holes. These holes dot the tidal flats in varying densities. Located siphon holes are then dug out by hand until the clam has been reached. It will be pulled up out of the hole and put into a bucket and the next hole located.

Disposition of Harvest

The amount of clams harvested by most households is usually only enough to supply their needs for one or two days. The clams are usually eaten raw along with other foods. Some people use clams in soups or chowders. Some households freeze small quantities for the winter.

Clams are a minor food item when compared to resources like seal and salmon. However, they are a stable resource that is readily available and can be gathered using a minimum of equipment and with a minimum of risk involved. Because there are other activities during summer which compete for time, the intensity of clam harvest varies among households. Some households do not dig for clams in a particular year while others may go often, starting in the late spring until right before freezeup.

Waterfowl and Bird Hunting

As mentioned earlier, the area around Hooper Bay contains nesting colonies of certain geese species and provides nesting habitat for a myriad of other bird species including gulls, terns, other waterfowl, shorebirds, loons and cranes. The birds nesting in this area are

present throughout most of the summer, incubating the eggs and raising the chicks. Most birds, especially waterfowl undergo molt during the middle of the summer. Although birds are present around the community during the summer, hunting activity is limited compared to the spring and fall periods. Unlike Kwigillingok, a low level of hunting continues throughout the summer because the labor intensive demands of salmon fishing generally lasts only through mid-July, ending in June during some years. The amount of salmon available to Hooper Bay residents is also less and highly variable as mentioned earlier. The need for diversification is probably greater in this community. Summer bird hunting commonly takes place in conjunction with other resource activities such as gathering, as noted above.

Plant, Berry and Wood Gathering

Location and Timing of Harvest

The collection of edible plants which begins during spring continues through the summer, often conducted in conjunction with other activities or interspersed between labor-intensive ones. The participants and gear are the same as that described in Chapter 4 for the spring. The species of plants available change as the summer progresses. Cowslip (allmaruat) becomes available in June, wild celery in July, and sourdock (aatunaq) and related species from late July through August. Women also gather the medicinal plant caiggluk ("stinkweed") starting in August, although it was noted that usage of this plant by the community is relatively recent. A more detailed list of plants gathered by Hooper Bay residents is presented in Appendix D.

Depending on the climatic conditions of the summer, salmonberries become ripe around the first week of August. As salmonberries ripen sooner in the interior area away from the coast, people leave the village by boat to make a camp from which to gather berries. Most of the tundra around Hooper Bay produces salmonberries, although some areas are better than others and specific locations differ each year. Camp sites are selected by a variety of criteria. Most sites are along major rivers or tributaries which permit boat access and where there are high densities of salmonberries nearby. Camp sites near waterways also permit the family to fish while at berry camp.

Since most households spend at least one week at camp, they fish and hunt for the majority of their food near camp area. The major rivers and tributaries where camps are located include the Kashunuk, Aphrewn, Manokinak, Ukalikchik, Kuyungsik and Nariyavek rivers, mostly south and southeast of Ingrisarak Mountain (Fig. 23). North and northeast of Ingrisarak Mountain are camp sites on the Kokechik, Chelunginik and Kolomak rivers (Fig. 23). These camps are south of the Askinuk Mountains. People remain at these camps from three days to two weeks. Some go to their camps more than once in the season. People are at berry camp anytime from the end of July until the last part of August. During salmonberry season, the whole village may appear to be deserted.

The gathering of driftwood occurs during most seasons of the year. Although the Yukon-Kuskokwim Delta coast only supports shrub willows and no trees of any size, wood products have always comprised a significant proportion of the Yup'ik material culture (Nelson 1979). Not only were household utensils such as bowls and ladles made out of wood, but also larger items such as qayaq frames, racks and the structural supports for

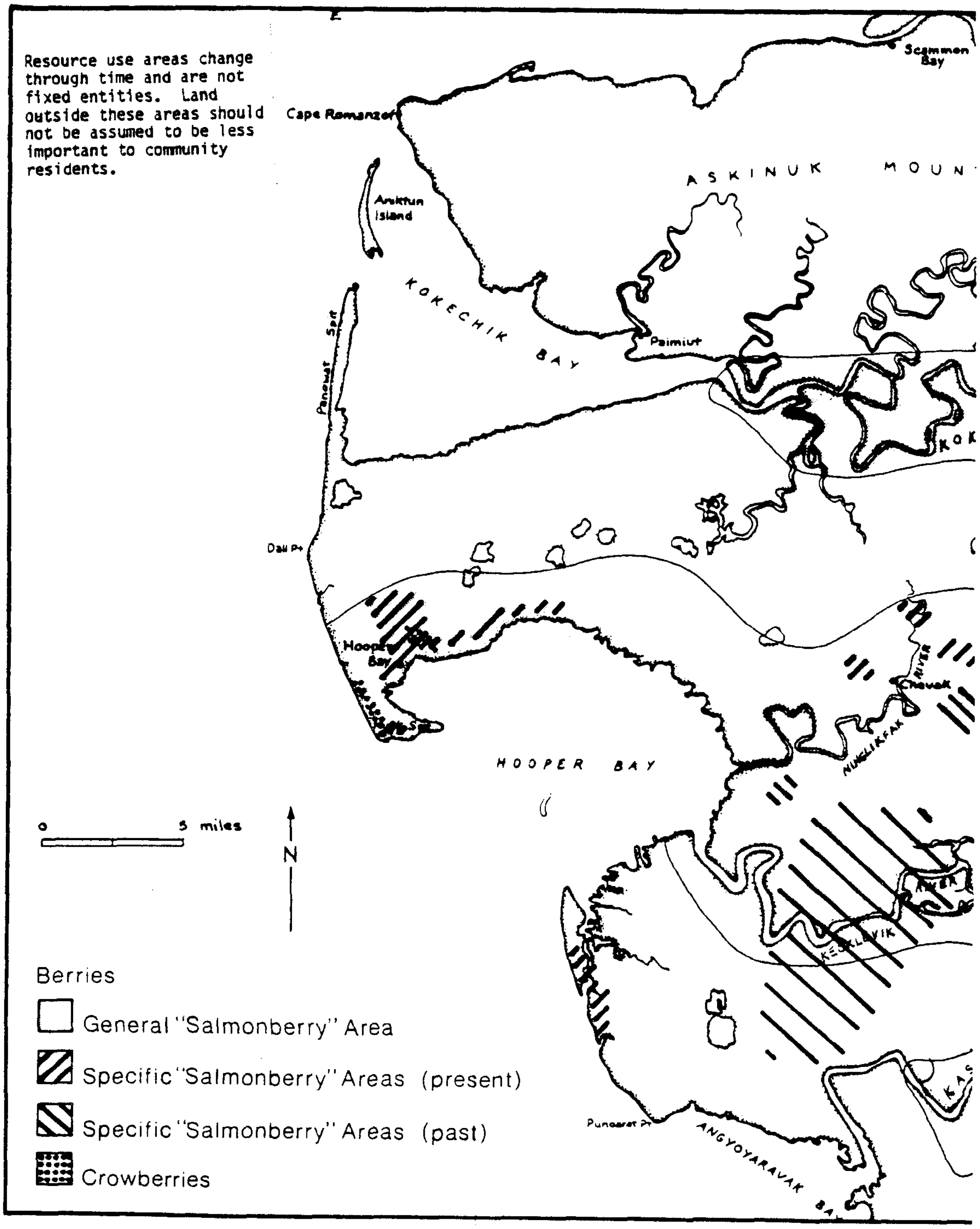


Fig. 23. Berry picking areas of Hooper Bay residents, c. 1981-1983.

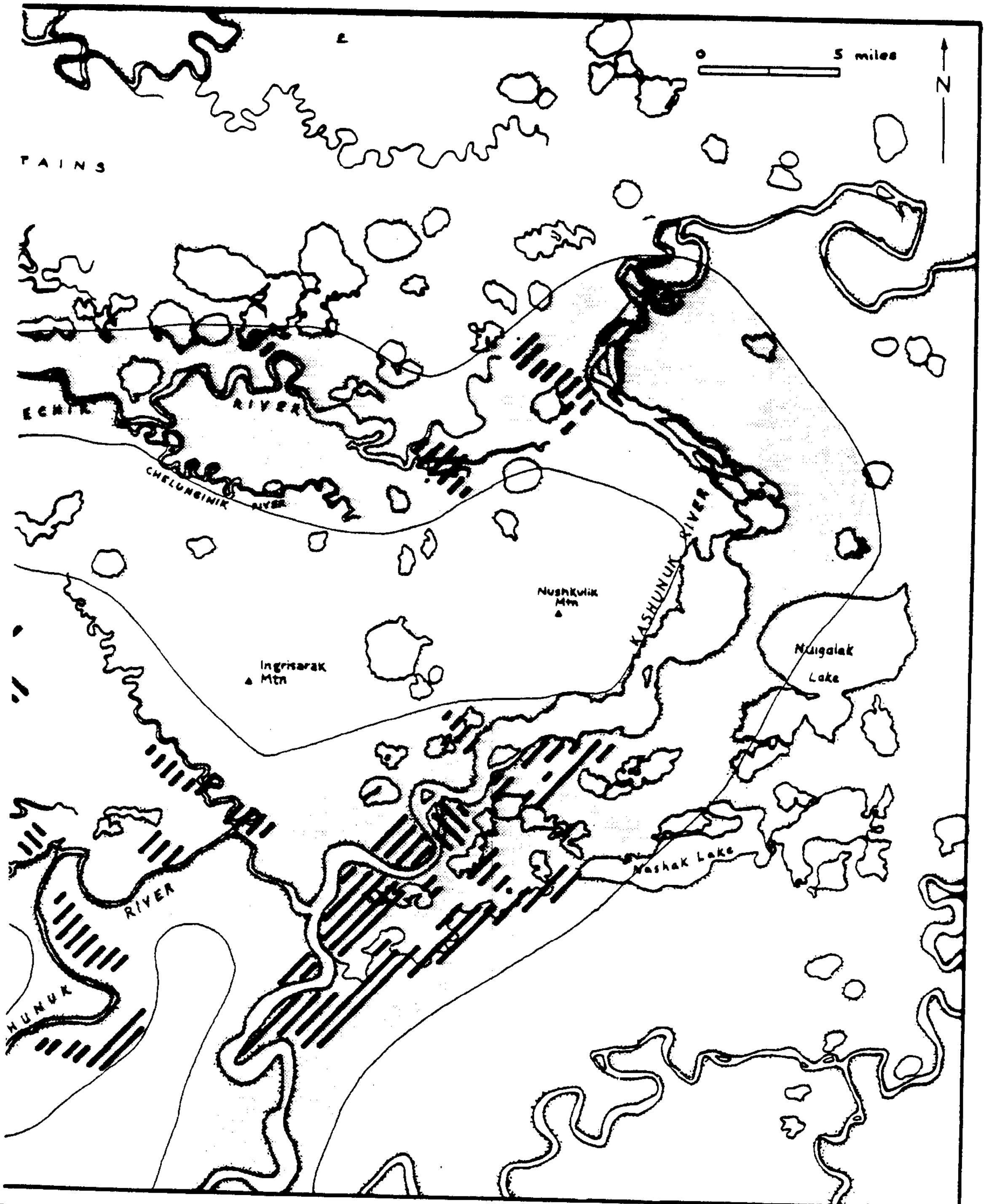


Fig. 23. Continued.

houses.

The major areas for gathering driftwood during the summer are the shores along Hooper Bay and the beach between Hooper Bay and Kokechik Bay (Fig. 24). As soon as the ice is out of the bay, men travel by boat looking for logs drifting in the ocean or washed up on the beaches. This early period of collecting driftwood is interspersed among the other subsistence activities, or is conducted incidentally with these activities. Later in the summer, in late August and September, collecting wood intensifies in preparation for freeze-up and winter.

Environmental Constraints

Weather conditions during the summer have a major impact on the success of berry plants in bearing fruit. A cold rainy summer on the coast with wind results in the salmonberry plants bearing little fruit. At these times people travel to several locations to harvest adequate amounts. Some people noted that wind especially had an effect on salmonberries, blowing the flowers away before they close. For this reason the interior areas produce more salmonberries than the windier, coastal fringe. It also was noted that on the hummocks and mounds that are part of the tundra away from the coastal fringe, salmonberries are most abundant along the sides and tops of the medium height mounds. High mounds are too windy and the marshy areas are too wet.

The availability of driftwood along the coast varies each year. The amount of ice in the rivers, the amount of bank scouring that takes place during break-up and the prevailing winds and currents at the mouth of Yukon River affect how much driftwood is washed up along the coast. Hooper Bay's

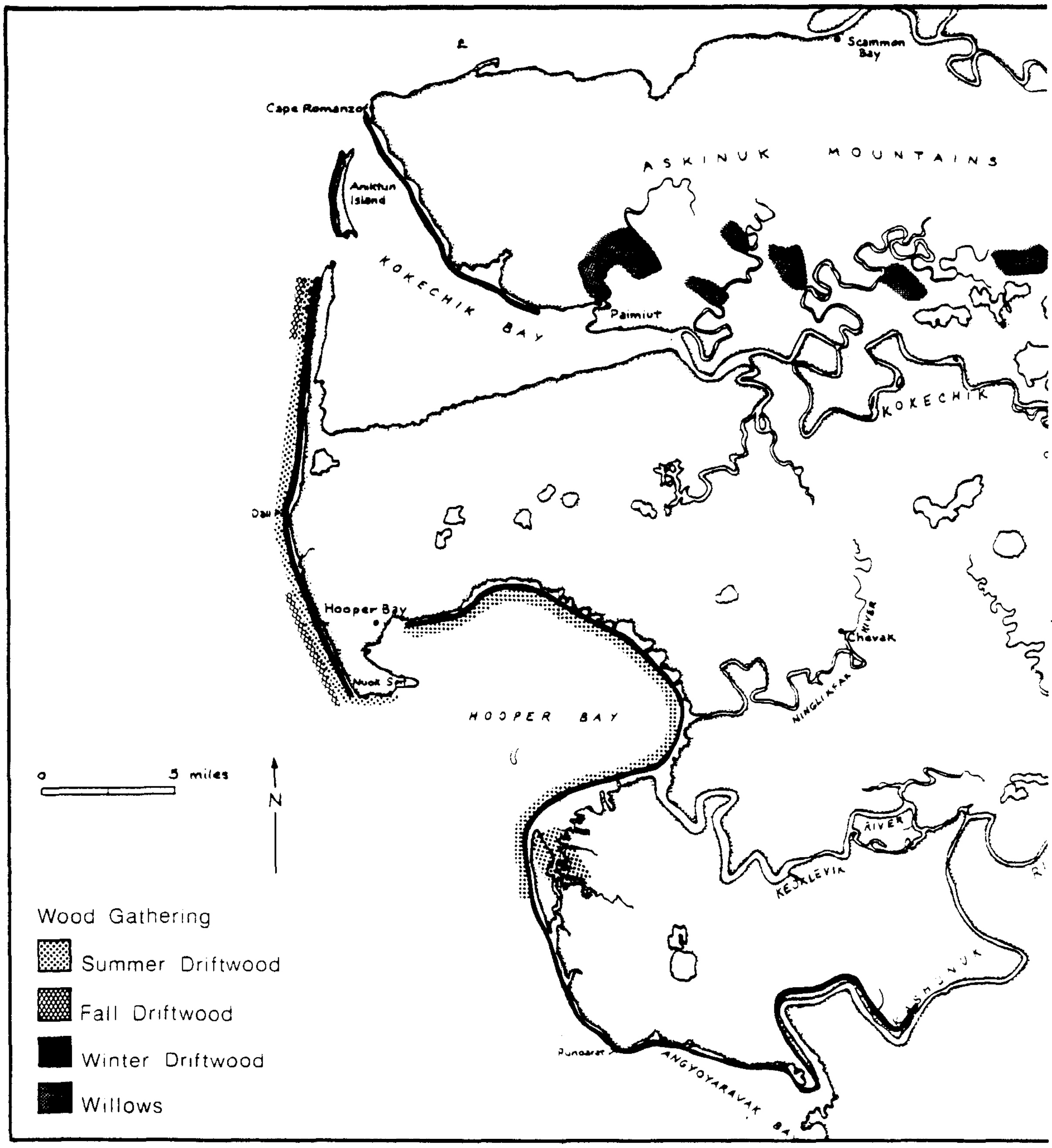


Fig. 24. Driftwood gathering areas of Hooper Bay, c. 1981-1983.

distance from the mouth of the Yukon also affects how much driftwood deposition occurs each year. Some driftwood from the Yukon is diverted into the Kashunuk River and makes its way downstream via this stream system, providing an additional source for wood.

Logistics and Techniques

Picking salmonberries requires much support gear. Because most people travel away from the village and spend days at a berry camp to pick salmonberries, the amount of gear necessary to support this endeavor is large. Generally, the entire household goes to berry camp except for those people who are employed and do not take leave. Members from more than one related household may go to camp together. Most families use the large homemade wooden skiffs to which temporary plywood cabins are attached. These boats carry two outboard motors ranging from 35 to 75 hp. The second motor is often a spare. In addition, many families take along their aluminum skiffs for transportation at camp. The wooden skiff carries most of the family and gear, including at least two 55-gallon drums of gasoline, several gallon containers of 2-cycle oil, berry containers (30 gallon wooden barrels or 15 to 20 gallon plastic containers), smaller buckets, cooking gear, camping equipment and clothing. Other support gear includes fish nets, .22 caliber and .222 - .250 caliber rifles, 12 gauge shotguns, and the associated shells and bullets. This gear is used to provided the family with food while at berry camp. Food brought from the village includes main food items, such as dry fish and seal oil and supplements such as flour, sugar, tea, coffee, powdered orange drink and other items. The amount of gear taken along usually depends on the size of the family and the amount of time they plan to

spend at camp. Each household takes additional gear and food in case they get weatherbound and are delayed on their return home.

It requires 5 to 14 hours by boat for people to reach their berry camp sites. After they arrive, their camp is made and a location selected to put in fish nets. Berry picking is quite intensive. Family members pick berries all day, weather permitting, only taking breaks for lunch and dinner. Women and children are the primary berry pickers. Men sometimes pick berries, but also tend to the fishing net and hunt for waterfowl and crane if present while at camp. Camps are widely dispersed throughout the major rivers and tributaries. Berries are picked around the camp area, and at other nearby locations reached by boat. On the return trip some people set their nets somewhere for a few hours to get some fresh fish.

During the summer, the major gear used for collecting driftwood include a boat, axes, and saws and/or chainsaws. The boat is used to search for and retrieve wood, which is loaded into the boat and brought back to the village. The large wooden skiffs are usually used for this purpose, as they are more stable and can carry more. However, lightweight aluminum skiffs may be used, especially in the late summer or early fall when logs are stacked along the beach to be retrieved after freeze-up by snowmachine, all terrain vehicles or trucks.

Collecting driftwood is done by males from late adolescence and older. The major requirement is physical ability and access to the household skiff for this purpose. Usually gathering driftwood is an activity which individual household members undertake. Work groups frequently include fathers, sons, and brothers.

Usually during late spring and early summer people go out for wood

on an as-needed basis. Because this is a busy time of year, wood collecting is interspersed between other harvest activities. Later in the summer, wood gathering activities intensify as men start putting together a supply for winter. Trips are made to the beach throughout the fall and wood is placed in conical stacks. Households using wood for heat have several stacks of wood gathered before freeze-up. These stacks are retrieved mainly after freezeup with snowmachines and sleds. A few families with four wheel drive trucks or all terrain vehicles collect some of their stacks before freeze-up. Individuals usually respect another households' wood supply.

Disposition of Harvest

After returning from berry camp, a large bowl of akutaq is made using some of the salmonberries. Portions are distributed to the elders, relatives, and anyone in the village who has been named after a deceased member of the family. Married children living in separate households who did not go to berry camp are sometimes given containers filled with berries.

For families with freezers, berries are put into plastic bags and frozen for use at a later time. People without freezers either store them packed tightly into barrels in a sled, or place them in underground pits lined with sourdock (aatunaq). Berries stored in barrels above ground are more subject to fermentation, mold and substantial loss of vitamin C than those that are frozen immediately after return from berry camp, or those stored in pits with aatunaq.

Akutaq is more than just a dessert to Hooper Bay residents. It is made on a regular basis by most families and is served after meals or as

a snack during the day with tea and/or coffee. It also is made fresh when a household member returns home after a long time away or when distant relatives or close friends come to visit. During holidays, portions of akutaq are distributed to relatives, elders, and namesakes.

Wood that is brought back in the summer has diverse uses. If the summer is cool, households with woodstoves use the wood for heat. Families with steambaths or fire baths use the wood as a heat source for bathing. Other uses for driftwood include repairing or building racks, fuel for smoking fish, and making household implements such as ladles.

The predominant use for driftwood in Hooper Bay is currently as a source of heat. During summers temperatures are usually mild, and with so many other activities going on, it is not as imperative for households to collect large amounts of driftwood for this purpose. However, driftwood is necessary to smoke the dried salmon as the final process in its preservation. Because a cool fire must be maintained throughout the smoking process, which can last several weeks, enough wood must be gathered during early summer for this purpose.

DISCUSSION

Along the coast of the Yukon-Kuskokwim Delta, summer is the period when the snow, ice and threat of frost are finally gone. Temperatures, daylight, and soil thaw reach their maximum during this period. The spring migrations of marine mammals, waterfowl, and herring are over, and other local resources such as sculpin, bottomfish, plants and berries become accessible to village residents. The salmon start their annual migration during the summer months. In general, residents of both Hooper Bay and Kwigillingok harvest similar resources, subject to their availa-

bility and accessibility. There are some differences however, in the use patterns and amount harvested, of certain resources by each community.

For both the residents of Kwigillingok and Hooper Bay, the herring harvest has just barely been processed when the first salmon of the season arrive. Kwigillingok and Hooper Bay display different patterns of mobility during summer for harvesting salmon. Kwigillingok residents do not harvest salmon at the community itself but at the mouth of the Kuskokwim River over 20 miles away, a harvesting pattern with a long history. The difficulties of traveling away from the community to harvest salmon is compensated by the strength and stability of the Kuskokwim River stocks. More than half of the households are also involved in the commercial salmon fisheries in the Kuskokwim and Bristol Bay districts, deriving a major source of income using traditional skills. Most of the fishing households hold limited entry permits in the Kuskokwim River fishery. These people are able to participate in a local commercial fishery which historically they have always fished for subsistence uses using equipment that is also used for subsistence endeavors.

Hooper Bay residents harvest salmon near their community. They are dependent on harvesting Yukon River stocks which pass through the bay as they migrate north to the Yukon River. This is a subsistence fishery only. Unlike the stable Kuskokwim stocks near Kwigillingok, prevailing wind and current conditions in any given year can shift the salmon migration away from the coast resulting in a poor salmon harvest for Hooper Bay. Consequently, salmon is a less secure resource. Salmon are only present in the bay through mid-July most years, while Kwigillingok residents are able to harvest salmon through August. Salmon fishing is one of the most labor-intensive activities of the summer for both communities

since dried salmon is one of the major food items in the local diets.

Other activities take place during the summer, but tend to be interspersed between the more labor-intensive activities. For both communities, the gathering of edible plants continues throughout the summer and households collect the driftwood used to build racks, smoke fish, and fuel steambaths. Local resources such as clams, sculpin, sole, and flounder are harvested as desired to provide fresh food and diet diversity during the summer months. Both communities harvest the non-salmonid fish species that are locally available. The harvest of these fish is more intensive at Hooper Bay because the salmon run there is limited both in duration, stability, and size.

The salmonberries which ripen by late July are highly prized by local residents of both communities. Many families commit considerable time to pick a year's supply. Hooper Bay residents travel many miles and establish camps at regularly used areas for a week or more. During the time at camp they provide for their food needs by fishing and hunting as well as picking berries. Kwigillingok families also commonly camp to gather salmonberries, but they rarely spend more than three days at camp, and the logistic requirements to support this enterprise are less than those required by the activity at Hooper Bay. Individual berry pickers may visit relatives in Tuntutuliak or Kipnuk to take advantage of the east-west progression of the ripening process in this section of the coast and harvest more berries.

In terms of environmental conditions under which residents operate the summer is the easiest period of the year in which to harvest resources. Ice, extreme cold temperatures, and limited light are no longer problems. The generally mild climatic conditions combine to make summer the season

of peak productivity for many types of resources. Summer is also the period of maximum accessibility to resources that remain in the local area all year but become more difficult or impossible to harvest during the ice-bound months.

Environmental conditions still play a role during summer resource activities, however. The drying of salmon can be adversely affected by flies or too much rain. The harvest itself of salmon by Hooper Bay residents is affected by prevailing winds and currents. Cool, rainy, windy summers produce fewer salmonberries than do summers with generally mild, sunny conditions. Summer storms and periods of inclement weather affect traveling conditions and influence when resource activities of any kind take place.

Summer is one of the busiest periods of the year as people use the few short productive months to harvest resources in preparation for the up-coming winter. By the end of spring and summer, the majority of the food needed to carry community residents through the winter usually has been gathered. Resource harvests also take place during fall and winter, but these seasons and their resources may prove to be poor in any given year. Community residents have adapted over time to the somewhat unpredictable nature of the local environment, climate, and resource patterns by maximizing their harvests of available summer resources to meet their food needs through the winter. Summer is the most productive season in this regard, with spring and summer usually providing the bulk of the community food supply. Despite the richness of the summer and the relative ease of climatic conditions compared to winter, resource activities still take place within a framework of environmental constraints made up of several variables which involve the resources themselves as well the

climatic conditions under which the activities take place. These variables differ from year to year effecting variations in the summer resource harvest.

CHAPTER 6

FALL

ENVIRONMENTAL CHARACTERISTICS

By September, temperatures begin to drop noticeably in comparison to the summer months. Temperatures in late September average between 38 and 40 degrees Fahrenheit compared to late August temperatures which average 50 degrees. By the end of September there are three less hours of daylight than in late August. The average wind speed is also higher in September. These factors result in the general climatic conditions being colder, and windier and more "stormy" than during summer. This trend continues until freeze-up, which normally takes place in late October to early November, but can occur as early as the middle of October or as late as late November (National Weather Service, per. comm. 1983).

Many activities from summer carry over into the fall and persist until freeze-up. Gathering activities such as berry picking or edible plant gathering shift focus to other species. Other activities intensify in preparation for winter, and a few activities are re-initiated after a lapse during the summer. Fall represents the last opportunity to harvest some resources such as plants and waterfowl before winter returns.

Seals

A few seals remain in the coastal waters of the Yukon-Kuskokwim Delta throughout the summer. In particular, spotted seals frequent the sandbar islands which dot the coast and the tidal mouths of rivers (Burns 1978; Ronald et al. 1982). By fall the number of seals off the coast begins to increase markedly, as more seals migrate southward into the area in

advance of the growing ice pack. Many of the seals move up some of the larger river systems in the area as they prey upon fish. All species commonly found in the area in spring arrive in varying numbers off the coast. The fall movement of seals, though not as dramatic as the spring migration, provides coastal residents with another opportunity to acquire seal meat and oil before freeze-up.

Walrus

Walrus also migrate south down through Bering Strait in advance of the growing ice pack. As in the spring, the fall migration of walrus occurs near the end of the seal migration and just prior to freezeup. The walrus migration is also not as dramatic at this time. They are encountered swimming in open water and not as closely associated with ice floes.

The fall migratory route of walrus is far off the coast of Hooper Bay as in the spring, and any harvests at this time are opportunistic. Some animals appear to break off from the major migratory route and pass through the Etolin Strait, eventually passing in the vicinity of Kwigillingok.

Belukha

The belukha (cetuaq, *Delphinapterus leucas*) is one of the most abundant whales in the Bering Sea (Fay 1978). It usually resides in areas of seasonal pack ice in the arctic and subarctic seas, although a small herd is known to frequent Cook Inlet near Kenai Peninsula. Its general habitat is in the shallow waters of the continental shelf where it feeds to a depth of about 40 feet. Some belukha travel up fresh water rivers for several miles in search of food. They demonstrate a sensitivity to acoustical signals from any source (Fay 1978). Generally, the appearance

of belukha around Hooper Bay appears to be tied to the advance and retreat of the ice pack. Most animals are sighted in the fall, some in the spring, and a few during the summer. In the past, Kwigillingok residents have harvested belukha (Drebert 1956). For reasons yet to be determined, the belukha migrations have altered so that they are no longer seen off the coast of Kwigillingok.

Waterfowl

By late summer, the summer migrant waterfowl have molted and begin to flock in preparation for the long migration south. During the fall, the geese and ducks which had nested around Hooper Bay and Kwigillingok stage and depart. Myriad waves of other flocks from farther north along the coast also pass through the area. Also migrating south at this time are numerous species of shorebirds and cranes. The birds join others of their type, staging for a few days before moving down the coast to the next staging area. This fall migration is spectacular and short, lasting only a few weeks.

By early October, most species of summer migrants are gone or leaving. At this time, the birds are fat to sustain their long flight south, and therefore are in prime condition to be an important source of food. Once the birds have departed, they are not seen again until the following spring.

Fish

During the fall, Bering cisco make a post-spawning run down coastal streams. At the same time, saffron cod (*Microgadus proximus*, "tomcod") start to enter the river systems. Tomcod travel a considerable distance upstream into inland tundra areas. They usually stay within waters

that are subject to a tidal influence (Morrow 1980). After freeze-up, they start migrating downstream again.

Plants

The gathering of plants continues during the fall. Certain berries and edible plants are only available at this time. Other plants have been present throughout the summer, but only reach their prime during fall and freezeup. Plants available during the fall include not only edible species and berries, but also plants that have utilitarian purposes. Fall represents the last opportunity to gather plants before the coming of snow and ice.

The various grasses that have covered the tundra throughout the short growing season, begin to dry out as temperatures cool, winds increase and the first frosts occur. Most notable of the species are the grasses used for basketry (taperrnat, probably Elymus arenaria various subspp.) which grow only along the coast and the margins of tidal streams. These grasses seem to exhibit variations from site to site according to residents which are probably the result of variations in the micro-environment. There are probably subtle variations in the grasses gathered for boot insulation (Poa spp.) as well.

Other plants that become available during the fall are the roots of such plants as horsetail (Equisetum arvense and E. silvaticum), cotton-grass (Eriophorum agustifolium) and a species unknown to the researcher. These roots are collected by various tundra mice species and cached below ground for the winter, gaining the local English name of "mousefoods". The abundance of these caches depend upon mouse densities. Mouse populations are subject to cyclic highs and lows as well as the environmental

conditions of any given year. Conditions of extensive melt water on the tundra after breakup may be a source of mortality for these small rodents.

Driftwood gathering continues through fall for both communities, as does berry picking. During the fall, several berry species ripen. These late species include the crowberry or "blackberry", the lingonberry or lowbush cranberry and the bog cranberry.

Except for driftwood, the coming of freezeup represents the end of plant gathering season for the coastal areas of the Yukon-Kuskokwim Delta. Except for those few plants that can be stored, the only vegetable matter that will be available to coastal residents during the winter is the limited selection of canned and fresh vegetables carried in the local stores.

KWIGILLINGOK FALL SUBSISTENCE ACTIVITIES

During fall, subsistence activities intensify around Kwigillingok as the temperatures start to drop, leading to an eventual freeze-up of waters. A full range of hunting, fishing, and gathering activities takes place during this time, as people attempt to store several different kinds of food for the coming winter and spring. Many people try to store enough food to forestall a major resource failure during break-up, such as a poor seal season. Because the type and amount of resources available during winter are relatively restricted, Kwigillingok residents look upon fall as the last opportunity to harvest certain resources which will not be present again until the end of winter.

Seal Hunting

Location and Timing of Harvest

During fall, seal hunters generally search an area from 10 to 15 miles west of the village to the upper reaches of the Ishkowik River (Fig. 8). Occasionally during August and September some hunters travel as far west as the sandbar islands near Kipnuk. This trip usually is not attempted in October, as the traveling conditions are riskier at this time. The weather is more changeable and freezing conditions can occur within a short time. In the past, hunters looked for seals near the mouth of the Kuskokwim River while traveling back from fishcamps along the Kuskokwim River.

Some hunters start looking for seals as early as August, although the peak of activity is in late September to early October. Seal hunting continues to take place until the start of freeze-up, which occurs anytime from mid-October until mid-November. At this time, ice starts forming in the Kwigillingok River and along the coast, making travel conditions unpredictable.

Environmental Constraints

Some seals, especially spotted seals, stay in vicinity of this section of coast all summer using the sandbar islands as haul-outs. The number of seals dramatically increases in the area as fall progresses. They may remain in the area throughout the winter, depending on the location and condition of the ice pack. However, after freeze-up they are usually not hunted. The initial formation of ice makes water travel risky. The Kwigillingok River is shallow and tends to freeze early.

Ice along the coast breaks up and reforms many times due to tidal action before it becomes stable for safe travel. For this reason, seal hunting activity ceases as soon as ice starts forming on the water.

Logistics and Techniques

Seal hunting gear used in the fall is the same as that used in the spring, as described in Chapter 4. The only major changes is that white canvas atkuk (parkas) are not used during the fall hunting periods and it is possible to use the larger wooden skiffs. Since there is no ice at this time, there is no need for camouflaged boats.

Principally young men and people who did not get enough seals during the spring participate in the fall hunt. The partnerships that exist in the spring do not necessarily operate during the fall. Men commonly hunt with family members, such as brothers, and with friends during this time.

In the fall, seal hunters are able to search for seal much closer to the coast than is normally the case during the spring. Seals have less fat during fall and are more subject to sinking if they are not retrieved immediately. According to hunters, seals tend to be more wary in the fall. Even ringed seals, which are often curious in the spring and raise their heads above water for a few seconds, in fall only bring their head up slightly above the surface of the water before sliding down again. Seals tend to swim up some of the larger rivers at this time following fish. Hunters search much of the Ishkowik River as well as the submerged mouths of the various rivers and sloughs that drain this section of the coastal plain. If a seal is spotted, the hunters attempt to move closer for a shot. As in the spring, head shots are preferred, as wounded animals may elude the hunter.

Disposition of Harvest

The fall seal harvest is processed in a similar fashion to that of the spring. There is no village-wide distribution of the first fall seal harvested unlike in the spring. Sharing of meat and oil among related households is common.

Walrus Hunting

Location and Timing of Harvest

Walrus hunting occurs in the same general coastal area as fall seal hunting (Fig. 8), except for hunting up the Ishkowik River drainage, as walrus are not known to ascend rivers. The walrus migration tends to occur around the vicinity of Kwigillingok sometime in October or just prior to freezeup. Most of the walrus taken annually are harvested during this time. As described in Chapter 4, some walrus are taken in spring and occasionally an animal may be taken in August or September.

Environmental Constraints

The walrus availability around Kwigillingok is influenced by the routes of the walrus migration. As noted earlier, scientists have indicated that the major migratory route for walrus is west of Nunivak Island (Fay 1981). A small portion of the fall migration passes through Etolin Strait east of Nunivak Island. Kwigillingok residents noted that walrus are seen annually both in the spring and fall.

Logistics and Techniques

Essentially the same gear that is used for fall and spring seal hunt-

ing will be used for walrus hunting. However, larger caliber rifles are generally used to harvest these animals because of their great size. Walrus are harvested whenever encountered by seal hunters in the fall. Some residents noted that at this time the older and more experienced hunters may target specifically on walrus.

Swimming walrus are taken during the fall, as there are no ice floes present. A head shot is preferred to kill the animal outright, as wounded walrus are dangerous. Once a walrus has been killed, a few gaff hooks are imbedded in the carcass and the walrus is dragged behind the boat back to the village where it is processed and distributed.

Disposition of Harvest

The fall walrus harvest provides the whole community with a major source of food for the winter. The entire harvest of walrus, whether it is only a single animal or many, is distributed to every household wanting some.

The primary processing of walrus takes place along the river bank after the hunters return. The walrus is initially skinned and divided among all participating boats or between the successful hunter and his partner if only one boat is involved. The organs are the property of the successful hunter, but he may choose to share them among all the participants.

After this initial division, the wives of the participating hunters distribute their portion of the walrus to the rest of the community similar to the distribution of the first spring seal as described in Chapter 4. After an announcement is made over the community radio system, residents go to the hunters' house to pick up their portion. Each house-

hold is given a share of meat, hide, and blubber. Households related to the hunters commonly are given portions of organs as well.

Taking walrus is one of the last hunting enterprises before freeze-up. It is chiefly done to bring a large supply of meat into the community to create a food supply which will last until the following spring.

Fishing

Location and Timing of Harvest

Fishing for Bering cisco and tomcod takes place principally in the Kwigillingok River. Some fishing for both species also takes place in the Ishkowik River, its associated sloughs and sloughs near the community (Fig. 10 and 18). Fishing for whitefish takes place in the lowest stretches of the Kwigillingok River just below the community. Tomcod also are first harvested in this lower area, but as the run progresses upstream so does the site of harvests.

By the end of August, whitefish have started to move downstream to below the community where limited harvested occur. The number of fish increases in September as the post-spawning run increases in intensity. By freeze-up, there are few whitefish left in the river.

Tomcod start entering the Kwigillingok River by the end of August and gradually move upstream. By the end of September or early October they are quite numerous upstream of the community, and the bulk of the harvest is made at this time. Tomcod stay in the river after freeze-up and start moving downstream as the surface ice starts encroaching downward in the shallow river.

Environmental Constraints

Besides the factor of the fish runs mentioned above, the efficiency of harvest is increased by fishing on an incoming tide, especially in the case of tomcod. More tomcod move upstream while the tide is coming in than is usually the case when the tide is going out. However, because of the seining method used, most tomcod fishing occurs when water levels are low in the rivers.

Logistics and Techniques

Gear, participants, and methods are similar to those used for sculpin and sole described for summer fishing in Chapter 5. Generally the fish are seined by moving or dragging the net downstream and bringing the midchannel end of the net into the bank, trapping the fish within. Because much of this harvest takes place upstream where the river banks are steep, some fishermen choose to haul their nets directly into the boat. The tomcod are then removed and put into sacks or tubs. In addition to fishing for tomcod with nets, women hook for tomcod using a short pole with a string, weight, and one or more hooks. Women usually fish in the Kwigillingok River when water levels are high. At low tide, the water is too far from the bank for hooking to be effective.

Disposition of Harvest

Whitefish are generally processed as they are in the spring, that is by drying. Many are also eaten fresh. Those people with freezers may freeze a portion of their harvest in order to have frozen fish during the winter.

Most tomcod are dried by women and some are eaten fresh. Tomcod are

gutted and braided into long grass ropes. Strands of grass are plaited behind the gills. These ropes are hung on a drying rack and turned daily to aerate. Some families prepare as many as 40 ropes or more. Neither Kipnuk nor Kongiganak residents have much tomcod in their river systems, and residents of Kwigillingok share dried and frozen tomcod with their relatives in these villages.

Waterfowl and Bird Hunting

Location and Timing of Harvest

Waterfowl hunting begins at a low level during August, gaining in intensity with the fall migration of the birds in mid-September. Hunting for waterfowl and other birds such as shorebirds continues as long as there are birds present and conditions are safe to travel. Ducks and certain geese such as Canada geese and various shorebird species are most common at this time. Cranes and other types of geese are uncommon. During the fall, all hunting of waterfowl takes place on land, although hunters travel by sea to hunting areas along the coast and the Ishkowik River (Fig. 9). The Kwigillingok River and associated sloughs are searched as are many of the other sloughs draining the coast and the myriad lakes in the area. Some hunters occasionally travel by scheduled airflights to other areas, such as those near Kipnuk, to hunt with relatives.

Environmental Constraints

The success of the nesting season essentially determines the magnitude of the fall migration. Years with poor conditions for nesting, such

as in 1982, result in few birds. Both adults and "young-of-the-year" pass through the through the Kwigillingok area in the fall. Poor weather conditions, such as storms or rainy, windy periods, also hamper hunter efforts. Many species, such as cranes, fly high at this time becoming largely unaccessible. Others such as various duck species and geese, such as snow geese, fly low as they come into local staging areas.

Logistics and Techniques

The gear used for fall hunting of waterfowl is similar to that described for spring. Boats are used for transportation and shotguns for harvesting. Participants range in age from older adolescents to middle aged men. Fall hunting of waterfowl is undertaken by itself or with other activities such as gathering of driftwood. Men go out for a few hours or for an entire day, depending on whether they are engaged in other activities. They may travel moderate distances, such as to the Ishkowik River (16 miles away) depending on whether they are pursuing other resource activities, and on whether bird densities are low closer to home.

Disposition of Harvest

Birds harvested during this time are handled similarly to those taken in the spring. Many are eaten fresh in soups. Those households with freezers freeze part of their harvest for the winter, gutting the birds, but leaving them unplucked to protect them from freezer burn.

Plant Gathering

Location and Timing of Harvest

With increasing cold temperatures, many of the tundra plants start to wither and die. Most of the plants gathered during the summer are no longer in prime condition. During the fall two distinct plant groups become available despite the decline of plants in general. The local rodents gather assorted roots described earlier in preparation for winter and bury them in caches all over the tundra. Women look for these caches, digging up the food that the mice have accumulated. These are called collectively "mousefoods" in English. These roots are made up of the horsetails (utngungssaraat), cottongrass (anlleq) and a root that residents call nequsegiit (species unknown). Women also gather a few other edible plants, berries, and driftwood at this time. More detail is given in Appendix C. Another plant group that is gathered during this period are grasses, used to make grass ropes, insulate winterboots, and create crafts which are sold to bring cash into the households.

Both edible plants and grasses are gathered in similar areas, located up the Kwigillingok River and along the beach west of the community (Fig. 11). Mousefoods are gathered the entire length of the river, while grasses are collected for a few miles upstream. The beach is searched for grasses. Some people go out from the village on foot to gather grasses, but many use boats to get to the gathering areas.

Mousefoods may be gathered from September through freeze-up. The latter part of September is better than the first half. Some women begin gathering grasses as early as late August although the peak of gathering usually occurs in September and October after there have been frosts.

These plants can be gathered until freeze-up.

By September, the late berries are ripe or ripening. The major berries gathered during the fall include the crow or mossberry (_tangerpak_) and the lowbush cranberry or lingonberry (_tumaglit_). Other berries that are occasionally gathered by women include bearberries (_qaviliit_, _Arctostaphylus alpina_) and bunchberries (_cengqullektat_, _Cornus suecica_ or _C. candensis_ x _suecica_). These latter berries are usually gathered for eating while picking the other berries, although some women will use bearberries in jam, usually mixed with crowberries. Both crowberries and lingoonberries are gathered in lesser quantities than are the salmonberries.

The gathering of fall berries takes place within a few miles radius of the village (Fig. 19). It was noted that crowberries especially could be found all over. Most people pick crowberries just outside the village. For lingonberries, some people head upriver a short distance, often in conjunction with grass gathering and fishing. Crowberries can be picked as early as late August, but most gathering occured during September when they are larger and in prime condition. Lingonberries are ripe by the middle to the end of September and are gathered until freeze-up. They are not as prone to frost damage as are most other berries and may also be gathered in the spring after most of the snow has melted.

Environmental Constraints

As with many other species of mammals, rodent populations tend to cycle with periodic highs and lows. Weather conditions that might influence nesting success, such as cold wet summers or extensive meltwater flooding on the tundra during the spring, may also influence population

levels on an annual basis outside of the periodic highs and lows. The number of rodents directly influences the density of food caches on the tundra.

Both crowberries and lingonberries are hardy tundra plants and can withstand most conditions that might occur in any particular growing season. Usually, however, crowberries tend to be more numerous during summers which have poor conditions for salmonberries, such as cool temperatures and greater than average rainfall.

Logistics and Techniques

The gathering of mousefoods and grasses, like other gathering activities, requires a minimum of gear. Usually some sort of container, such as a backpack, bucket and plastic bags, is used to gather these plants. Grasses are usually cut at the base of the stem with an uluaq and then placed stem first into a plastic bag before being put into a back pack. Mousefoods are smaller and can be carried in either a bucket, a backpack, or other containers. Boats are used as logistic support to get to different areas, although the gathering will be accomplished on foot.

Most gathering of these plants is done by women over 20 years of age. Younger women in school are unable to participate, except after school or on Saturdays. Women go out individually or with one or two relatives such as daughters or sisters. Older women are the principal basket weavers and gather most of the grasses, although younger women in the household may use these as well for their baskets. Boot grass is gathered near the community, again by older women.

Women look for mousefoods by walking the tundra searching for caches, often near the banks of waterways. When they locate one, they push apart

the grasses and enlarge the hole leading into the cache with either their hand or foot. When the hole is large enough, they scoop out most of the roots and tubers that make up the contents of the cache, placing them in a container. The gathering of grasses and mousefoods sometimes occurs in conjunction with other activities such as berry picking or tomcod fishing.

Gear requirements for harvesting fall berries are similar to that used for salmonberries. Some women use a small metal berry rake to harvest more berries in a shorter period of time. These rakes are open-ended boxes with a rake-type teeth on the bottom of the opening and a handle on the top. The berries come free by combing the plants, a procedure which occasionally pulls the plant out by the roots. For this reason some women prefer not to use these rakes, since it seems to damage future plant production. Both type of berries are gathered in short excursions lasting a few hours or on day-long trips.

Disposition of Harvest

Mousefoods are usually eaten as a vegetable either boiled by themselves or added to soup. Different roots make up mousefoods and they have different textures and flavors.

Grasses are separated by size. The long ones (kelugkaat, species unknown) are used to make the ropes for braiding and drying fish. They also are used in construction of coarse grass mats, which may be used to line pits where fish are fermented. The shorter grasses (taperrnat, Elymas arenaria) are used in the construction of basketry items, such as decorative baskets, issran (grass bags), and used in conjunction with thread in construction of seal gut raincoats. Grasses are prepared for use by first making large loosely woven mats for drying. This is done by

separating the bundles of grasses into smaller bunches. Other grasses or long strips of cloth are braided around the stalk end of each bunch, forming the mat which is hung to dry in the entryway or storage house. These grasses will not be used for many months or until the following spring. Grasses which are used for boot lining (canget, Poa spp.) also are dried, but they do not require as much care as the basket grasses or grasses for fish ropes.

Currently, the most important commercial products made from grasses are basketry items. Decorated with dyed grass or seal gut designs, these baskets are a chief occupation of the women during the winter months and can be one of the major sources of cash income during the winter and sometimes on an annual basis. These baskets are commonly sold in Bethel, but some are sold in Bristol Bay during fishing season or exported to Anchorage or other cities for sale. Some baskets are sold to visitors to Kwigillingok. Issran are made for home use. These large mesh grass bags are used to store dried foods in caches and as "backpacks" while gathering. Boot grasses are used to line winter foot gear, especially skin boots, as insulation.

Lingonberries and crowberries are usually added to salmonberry akutaq to add diversity and different flavors. Most of these berries are frozen until needed. Some families also make jam with these berries, but this usage is not common.

HOOPER BAY FALL SUBSISTENCE ACTIVITIES

Seal Hunting

Location and Timing of Harvest

Usually the common hunting area for fall seals is throughout Hooper Bay and up some of its major tributaries (Fig. 12). As mentioned in Chapter 5, sporadically during the summer seals are encountered during other activities in the bay and some people harvest them at that time to provide fresh meat and seal oil. During the fall, seal hunting becomes a major activity, intensifying as seal densities increase as part of the fall migration. Participation in seal hunting at this time is not as intensive as in the spring. The hunters search the entire bay, especially the tidal areas, and the lower portions of the Keoklivik and Kashunak rivers (Fig. 12). People also hunt on the outer coast of Nuok Spit. Some hunters travel north as far as Kokechik Bay and south to the mouth of the Aphrewn River via the Keoklivik and Kashunuk rivers (Fig. 12). Some seals are encountered several miles from the mouth up some of the local rivers. Some hunters note that they might hunt up the mouth of the Keoklivik River, turning south to the mouth of the Kashunuk River and returning by way of the coast to Hooper Bay, if the weather is good. They would return via the river systems if it was not. People from Hooper Bay continue to hunt until the formation of ice and other conditions make boat travel hazardous.

Environmental Constraints

Generally the weather during September and October is considered

stormier than that of the summer. The bay is the usual search area for seals, since the sea is rougher during this time. Longer trips along the coast such as to the entrance of Kokechik Bay or to the mouth of the Kashunuk River, are only undertaken if the weather is good.

The other major environmental influences on fall seal hunting include the movement of seals into the bay and their behavioral responses during this time of the year. The southward advance of the pack ice through the Bering Strait, the prevailing winds and currents during September and October, and the size of the seal population will influence the number of seals migrating through Hooper Bay. The ice related seals (bearded and ringed) move into the Central Bering Sea coast area only after pack ice has moved through Bering Strait. The average prevailing winds during August and September tend to be from the south-southwest which are conducive to bringing the seals into the bay. Also, the presence of fish in the bay and the migration of tomcods up the rivers at this time influence seal movements within the bay as they search for food. Hunters noted that seals tend to be warier during the fall and are apt to sink faster due to a reduced fat content.

Logisitics and Techniques

Similar gear is used for fall seal hunting as that described earlier for spring seal hunting. The clothing necessary for fall seal hunting is often likely to be foul weather gear. Heavy clothing is used in cold conditions. Tools such as ice chisels that are necessitated by the ice conditions during spring are not needed during fall. Either wooden or aluminum skiffs are used at this time.

In general, people who participate in fall seal hunting are usually

from families who either were not able to get enough seals during the spring season or want some fresh meat or additional seal oil. Not only is this hunting period less intense, but it is less rigidly structured than the hunting done in the spring. Very often the hunting is undertaken by younger men, although older men also participate. Women are responsible for processing the harvested seals.

Disposition of Harvest

Seals harvested during this time are not subject to the type of village-wide distribution typical during spring. The women process them like the seals taken during spring. The fat is rendered into oil and the meat is eaten fresh or stored for the winter by drying or freezing. The meat frequently is shared with other relatives, but a ritualized village distribution is not followed.

Belukha Hunting

Location and Timing of Harvest

During the fall, the harvest of belukha usually occurs in conjunction with seal hunting. Some hunters noted that they usually spotted belukha in the deeper tidal areas of the bay near submerged river mouths. Belukha also are encountered occasionally throughout the bay and up the Keoklivik and Kashunuk rivers (Fig. 12). Although belukha frequent Kokechik Bay, many do not hunt them there. The deeper water precludes effective hunting and it is too risky for an overloaded boat to take coastal trip back. The size of the belukha harvest varies considerably from year to year. Recent harvests have ranged from none to over 40

animals harvested in one fall. Harvests of less than ten whales per year are most common.

Environmental Constraints

The appearance of belukha in Hooper Bay is not a predictable event, although they are more likely to be encountered in the fall and the spring. Their appearance is in association with their migration which follows the advance and retreat of the ice pack. They come into the bay to feed, following the fish which they prey upon, even to the point of ascending the larger rivers. Their feeding movements tend to only bring in a few individuals or a small herd at a time. Mass movements of belukha into the bay occur if killer whales, their chief predators, or other large whales are in the area. Some hunters say this is the time that the most belukha are seen in the bay and the time when the largest harvests are made. Because of their sensitivity to sound, there are possibilities that the sound of outboards may influence the movement of belukha into the bay.

Logisitics and Techniques

The equipment used for seal hunting is used for taking belukha. Belukha are herded by boat into shallow water where they cannot maneuver as well. As the hunters get close, they attempt to shoot the whale in the blow-hole for the most effective shot. Harpoons are used to secure the animal and make it easier to dispatch the whale with a shot from the rifle.

Disposition of Harvest

The harvest of belukha is relatively unpredictable. When one or more belukha are brought back to the community, they are distributed village-wide. A call is usually sent out over the citizens-band radio network announcing that a belukha has been taken. People who want belukha meat are invited to receive some. The belukha is brought to the community dock. If more than one boat participated in the capture, the belukha is first divided among the crews and then each crew helps with cutting their portion for distribution. The most desired part is a portion of skin and blubber which is given to every household that comes plus some cut of meat such as a piece of the backbone, ribs or other sections. Hunters retain the organs, sharing portions with relatives. Usually people receive enough belukha for immediate consumption over one or two days. The meat is usually eaten after it has been lightly boiled ("half-cooked"). The skin and blubber are considered a delicacy and are eaten raw.

Village residents indicated that because belukha are large animals and are harvested on an unpredictable basis, there is special significance to the village when such an animal is harvested. These and other large animals whose harvests are uncertain, are shared among most households in the village, in order to let everyone benefit in the harvest.

Waterfowl Hunting

Location and Timing of Harvest

Most of the areas used during spring waterfowl hunting are used during fall. The Keoklivik and Kashunuk rivers are commonly hunted. Some hunters hunt the lower stretches of the Aphrewn and Manokinak rivers

traveling there by way of the other two rivers (Fig. 13). A few hunters go by river routes to hunt in Hazen Bay and the large lakes at the eastern end of the Askinuk Mountains (Fig. 13). The area on northern Kokechik Bay is known to be good for emperor geese. Hunters noted that Kawialik Lake at the east end of the Askinuk Mountains is a staging area for snowgeese as well as a good area to fish for whitefish (Fig. 21). Although waterfowl hunting has taken place sporadically during the summer, hunting intensifies through September concurrently with the peaking of migration in the area.

Environmental Constraints

Poor weather conditions restrict fall waterfowl hunting. The stormy cold weather that is frequent by the end of September restricts hunters' ability to travel. Some species such as most ducks and shorebirds are not specific in their choice of staging area, whereas other species such as snowgeese return to a few areas year after year. Areas that are common staging grounds provide more efficient and successful hunting than other areas. A final consideration during this time is the increased wariness of the birds. Many species fly high over land at this time, far out of the reach of guns, making them more difficult to hunt.

Logistics and Techniques

The equipment required by fall waterfowl hunters is similar to that used in the spring. The composition of hunting parties also is similar. In most cases the hunting is carried out by younger men from the late teens to early 40s. In cases such as overnight camping trips to Kawialik Lake the elder heads of households are initiators and active participants

in hunting. Some women may go along on hunting trips, but usually to participate in gathering activities while the men are hunting. While some trips are made solely to hunt waterfowl, many trips during the fall are multifocused. For instance, trips to Kawialik Lake are used for hunting for snowgeese and to harvest whitefish. Trips to the plateau area east of village combines waterfowl hunting with berry picking, plant gathering, setting blackfish traps, and fishing for whitefish and tomcod. Thus, hunting trips not only yield waterfowl, but numerous other resources for immediate and future consumption.

Disposition of Harvest

Waterfowl harvested during fall are processed and used the same as in the spring, except that the down from fall birds is not retained because it is not considered good at this time. Some of the birds are eaten fresh. Most are processed for storage in freezers, gutted, but unplucked. Households without freezers store birds after plucking and gutting by packing them into containers such as buckets with salt.

Fishing

Location and Timing of Harvest

The harvest of tomcod (saffron cod) during the fall takes place in two distinct areas - - in the bay near the mouths of local streams and along the nearby sloughs (Fig. 25). Fishing with nets takes place in the shallow tidal areas up and down the coast of the bay and in the wider streams streams such as the Keoklivik River (Fig. 25). Fishing for tomcod with hooks or dipnets is done closer to the village in the Napay-

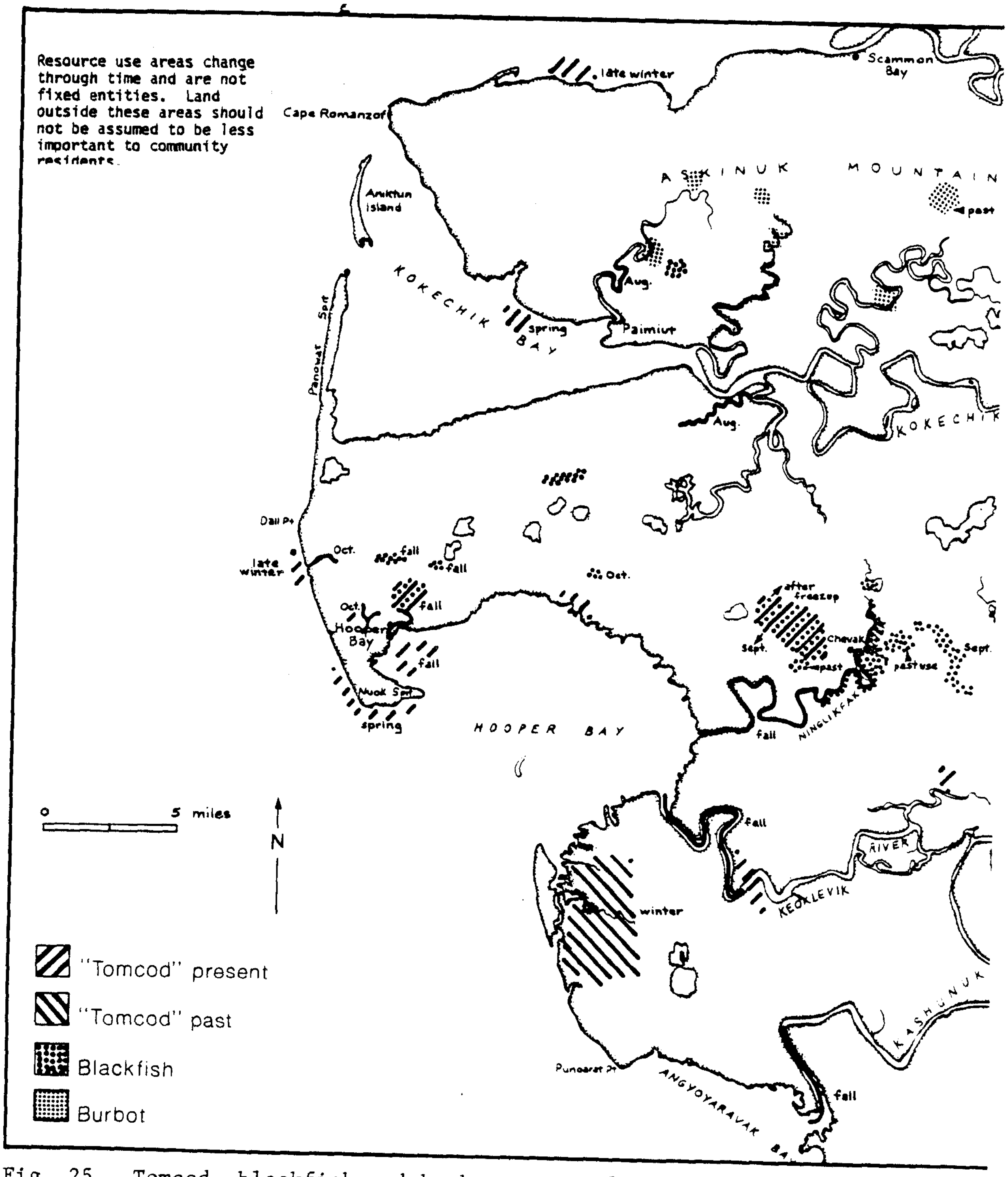


Fig. 25. Tomcod, blackfish and burbot areas of Hooper Bay residents, c. 1981-1983.

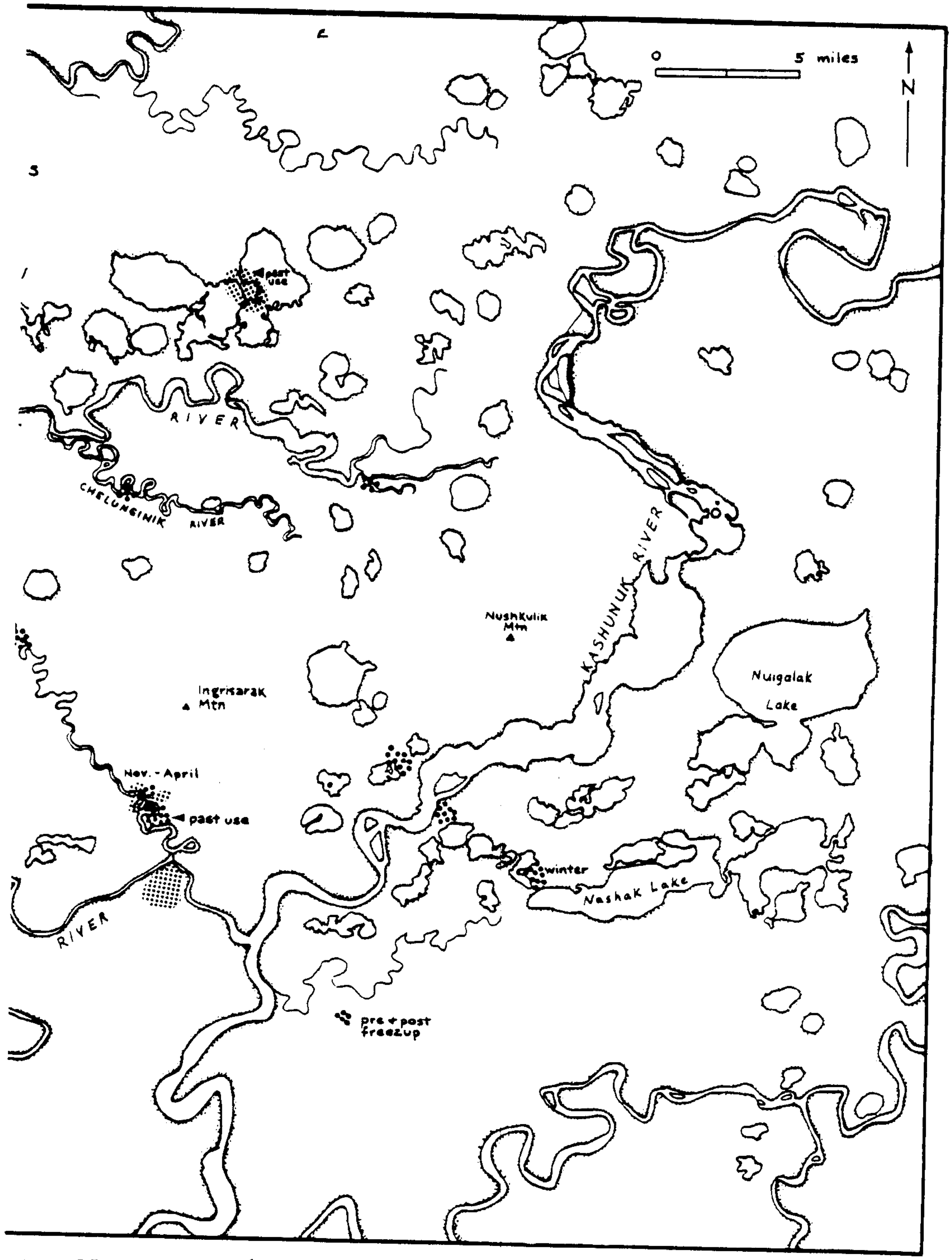


Fig. 25. Contined.

araq River and other nearby sloughs. It is possible for this activity to take place on more distant streams in conjunction with other activities, but is not usual. In addition to tomcod, fishing for whitefish, flounder and sculpin continues around Nuok Spit and other areas noted in Chapter 5.

Environmental Constraints

Tomcod are present in the bay during the summer, but at this time they are in deeper water and are not actively harvested. Moreover, local people stated that tomcod were "skinny" during the summer and therefore it was not the preferred time to harvest them. By September, after they have fattened during summer in preparation for spawning, they move inland and up the local streams to spawn. Their large numbers facilitate an efficient harvest. They may be harvested in the bay in set nets and with hooks in the river at anytime other than low tide. Women do not hook in the river at low tide or periods of low water because the water is too far from the bank. As with other activities, the weather influences fishing. Stormy or inclement weather affects boat travel and makes hooking for long periods of time uncomfortable.

Logistics and Techniques

Net fishing for tomcod uses gear similar to that used for harvesting for whitefish, sculpin and flounder. Some people stated that they usually use small nets (about 60 feet-long) with smaller than three inches mesh like that used for herring. Other people said they use their whitefish nets because they could catch large tomcods.

The gear used for hooking include a short wooden pole with a length of string attached and one or more treble hooks with weights. Whitefish stomachs and clams are commonly used for bait.

Another gear type used to fish for tomcod in small rivers and sloughs is a type of bag net similar to a fyke net (qalu). This small mesh net has an opening about five feet wide and less than two feet in height, which is attached to two short poles on either side. The bag of the net itself is about ten feet in length with mesh measuring about one inch.

The participants vary according to the method of fishing. As noted earlier, net fishing is conducted by the men in the household. Men also place and check the bag nets in the rivers and streams. On the other hand, hooking is largely the domain of the women of the household, frequently accompanied by young children. Because this fishery occurs along the river banks right at the village, it is common for individual members of households or small groups to go down to the slough for a few hours at a time.

Fishing for tomcod with a set net is the same as fishing for whitefish, flounders and sculpins described in Chapter 5. Nets are set near Nuok Spit and in or near some of the larger rivers, taking tomcod and other species. Nets are generally set for one day only in more distant locations (Keoklivik River and others), when fishing is usually conducted in conjunction with other activities such as waterfowl and seal hunting.

Men set the bag net both in upstream portions of the Naparyaraq River and in Akulakuteq Slough near the housing section of town. They first affix the poles and allow the current to stretch out the bag in the streambed near the bank. They then walk above or below the opening of the net, depending on the current, and create a disturbance in the water

to scare fish into the net. After this the men return to the net site and pull up the net.

For the hook and line fishing, participants stand and sit on the bank of the river when water levels are relatively high. A length of line, often around 15 to 20 feet, is thrown out into the current, a weight pulling it down and back towards the bank. The pole is either held in the hand or stuck upright into the bank and the line checked by watching it, feeling movements transmitted through the pole (if held), or by holding on to the line itself with the fingers. If a small tugging movement is felt on the line, the line is pulled up to the bank quickly. The fish are unhooked, hit on the head with a small stick, and put into a container, such as a bucket or carrying bag, or laid on the bank. The hooks are rebaited if necessary and cast back into the current. Experienced women tend more than one pole at a time, while children use one pole. It is not uncommon for 30 or more fish to be caught in a few hours using this method.

Disposition of Harvest

Tomcod harvested in the fall have two major uses. A small amount of a daily catch is boiled and eaten fresh. Large quantities are often gutted and braided into grass or string ropes to be dried for winter. Most of the tomcod harvest remains within the immediate family but some fresh tomcods may be shared with other relatives.

Plant Gathering

In the fall, collecting driftwood and plants continues as discussd previously in Chapter 5. However, in the fall the emphasis shifts to

different variety of plants, only a few of which are edible. Fall is the time when Hooper Bay residents search for "mousefoods" (Iituk, Eriphorium agustifolium Honck and utngungssaaq, Equisetum silvaticum and arvense L.). As discussed previously, the stems and root nodules of these plants are gathered by rodents in the late summer and fall and buried in caches for the winter (Ager and Ager 1980). The coastal Yupiit search for these caches and gather the root collections. Goose grass (tayarut, Hippuris vulgaris) is also gathered during fall. The other plants available at this time, while not edible, provide raw materials used in several spheres of village life, especially grass species such as taperrnaq and various Poa species. These grasses are gathered in the fall and sometimes immediately after freeze-up. In late September through early October some residents of Hooper Bay gather "mousefoods" near the village. Others travel to the Ninglifak and other streams draining into Hooper Bay to gather them (Fig. 16). The plateau areas north and east of the village was cited as good mousefood locations as were the "flats" between Napayaraq River and other streams in the marshy coastal fringe of Hooper Bay. Other people noted that in years of high mouse populations, all the tundra would have mousefoods. Other years, such as 1982, prove to be poor for mousefoods.

Some women start gathering grass in late September. This activity peaks around freeze-up after severe frosts have turned the grasses uniformly brown. The locus of grass gathering for basketry occurs along the beach between Nuok and Panowat spits. One of the best areas for grass is just north of the airstrip above Akulakuteq slough (Fig. 16). On the small coastal dunes, women gather taperrnaq that is used in weaving baskets for which the Hooper Bay and Chevak women are renowned. Grass-

gathering takes place here even by some Chevak and Scammon Bay women. Boot grass (evget, Poa spp.) is gathered right around the community itself.

The late berry species ripen in September. These include crowberries (kavlakuaq), lingonberries or lowbush cranberries (tumaqliq) and bog cranberries (uskuraaleq). The first two species are the most commonly picked berries at this time.

Fall berries are generally picked right around the community (Fig. 19). Some people travel by boat to other areas, to conduct berry picking in conjunction with other activities such as waterfowl hunting and fishing. Both crowberries and lingonberries can be picked along the dunes at the Nuok Spit area and along the hills that border the Napayaraq River. By late August or early September the crowberries are ripe. These may be picked throughout September provided there are not too many severe frosts. By mid-September the lingonberries ripen and they are picked until freezeup when they are covered with snow. They are not as subject to frost damage as are the crowberries. They may also be picked right after breakup.

Environmental Constraints

The availability of mousefoods is dependent on factors which have been described previously. The grasses which are gathered locally are hardy plants and well adapted to the coastal environment around Hooper Bay. The major environmental factor affecting the availability of basket grasses in certain areas is the gradual erosion of the dunes which support and protect the grasses. Around Nuok Spit there are at least two parallel series of high dunes between the beach and the low tundra. North of the

airstrip these dunes have been eroded by wave action over the years, so that there is only one series of dunes left and these are low and much deteriorated. Many women noted that if the erosion did not stop, they were in jeopardy of losing their prime area to gather grass. The north end of the airstrip is also being threatened by the continual natural destruction of the dunes and inward encroachment of the beach.

The late berry species are hardy tundra plants able to withstand most average climatic conditions. In general those conditions that are detrimental to salmonberry production (cool, wet summers) are favorable for late berry production. The late berries do grow under warm, dry conditions but the crop is smaller. Frost action softens the crowberries. In contrast, lingonberries do not reach their prime until after the first frost. Weather conditions during the fall influence the timing of berry picking, and cold, rainy, or windy conditions deter gatherers.

Logistics and Techniques

As with other gathering activities, the gear required to gather mousefoods and grasses is minimal. The major requirement for gathering is usually some kind of container which is normally a homemade grass bag (issrateq) or a backpack. Boats are used to reach more distant locations for gathering mousefoods and grasses. Mousefoods are gathered on foot, and gathering trips usually emanate out from the community. The gathering of grass is also done on foot. An uluaq or other kind of knife is used to cut the grass at the base of the stems.

Participants in both activities are usually women, as is the case with other plant collecting. Since children are back in school by September, this activity is most likely carried out solely by adult women and often

by the eldest woman in the household. Women gather alone or in small groups, usually made up of women from the same household. Men usually only provide logistic support to these activities, such as transportaion to gathering sites. Some men, notably husbands, occasionally help their wives gather mousefoods.

To gather mousefoods, women walk the search area they have selected looking for signs of mouse caches indicated by mud scattered about the tundra. When a pile of mud is sighted, the women test the area with their foot until they locate a soft or hollow spot. The women dig down into it using hands or feet until the contents of the cache are reached and scooped out. Usually several caches are unearthed before the return home. During years of high mouse populations, the search area covered to collect enough mousefoods for a few days' consumption is smaller than the area and time required during years of low mouse populations.

Grass gathering for taperrnaq is done by going to the beach area north of the airstrip and selecting grasses that are of the right height and dried-out consistency. The grass stem is cut off near the base with an uluaq and the grass placed stem first into a bag. Most women gather one or more large bundles of grass, especially if they are active basket weavers. Grasses used for boot insulation are also cut with uluaq and placed in bags to be taken home for further processing.

The gathering of the late berry species requires gear similar to that used for plant gathering during the fall and are conducted by similar participants. Most gathering of berries is done on foot with boats, trucks, or other land vehicles providing logistic support. Gathering takes place from a few hours to over an entire day. Camping trips are usually not made solely for the purpose of gathering the late season

berries.

Disposition of Harvest

Mousefoods are the roots and tubers of various plants including horsetail plants (utngungssaaq), fireweed (almaruat, Epilobium agustifolium) and cottongrass (Iitaq). The first two types of roots are cooked in soups with tomcod and other fish eggs or used to make akutaq without berries. Iitaq roots which are larger than the others, are eaten by themselves after boiling and cutting. They also are made into akutaq which is said to taste sweet without sugar. Usually the majority of a household's mousefoods harvest is retained within the household, although some limited sharing takes place with relatives. Goose grass is gathered immediately after freeze-up and used in soups with fish eggs and mousefoods.

Grasses are prepared for drying and storage by braiding small clumps (1/4" to 1" in diameter) with strips of cloth or last year's grass to form a type of mat. The mats are hung in a storage area with the stems facing up for several months or until the grass is uniformly dried. When needed, bunches of dried grass are taken inside the house where it will be moistened and wrapped in a plastic bag. The grasses are split into medium or fine strands depending on the women's preference and skills. These strands of grass are used to make grass articles, such as baskets, decorative mats, dance fans, and other items. Some of the grasses are dyed for decorative patterning. Some of the items made are for household use, but most are for sale to bring income into the household.

Hooper Bay and Chevak are renowned for their fine basketry and for many women making baskets and other woven items is a major labor expen-

diture during winter. Articles, especially baskets, take over a week or more of intensive daily labor to produce although it is common for basket weaving to be interspersed with other activities. For many households without a member holding a cash-earning job, basket making may be one of a few sources of cash income. In addition, grasses gathered in the fall are used to construct issrateq, the woven grass bag which is used for gathering and storing many dried foods since its open mesh construction permits air circulation. Local grasses are used to make the braided ropes for drying herring and tomcod. Boot grasses (*Poa* spp.) provide insulative material for winter boots, especially skin boots. Thus, local grasses provide raw materials that are important in many activities.

Fall berries are used principally in akutaq. In the past they were used to produce dyes and occasionally had medicinal uses. Crowberries are mixed with salmonberries or with sourdock to make akutaq. Lingonberries are used in berry akutaq and jam. In the past they were also used to treat the sore mouths of teething babies.

Fall berries are frozen by those who have freezers or stored in barrels or sacks in a cool spot by those who do not. Although these berries are not valued as highly as the salmonberries, they still constitute an important component of many families' winter food supply.

DISCUSSION

In many ways, fall is a mirror image of spring, although the transition from summer to winter is less dramatic than the transition from winter to summer. Fall is characterized by a gradual cooling trend in temperatures, coupled with increased periods of wind and decreasing

daylight. Although summer-like days occur, the general trend is toward colder, windier, and darker days. The first frosts occur during the fall signalling the end of the growing season for plants and sparking the migrations of various resources.

The waterfowl, shorebird, and crane resources which migrated to the Yukon-Kuskokwim Delta during the spring start their return to their wintering areas during the fall. Increased number of seals show up along the coast in advance of the ice pack that once again begins to move south.

The migration of key resources and the proximity of freeze-up and winter make fall an intense season of harvest activities for residents of Kwigillingok and Hooper Bay in terms of both time and effort. In both communities, the harvest of resources intensifies because fall represents the last opportunity to harvest many species for the year. Freeze-up marks the end of availability of summer migrant birds, edible plants, clams, many fish species, and most seals. The gathering of driftwood also intensifies, especially for Hooper Bay residents, as many rely on wood as a major source of fuel for heating their houses during the winter.

Some resources become available during the fall for the first time. Tomcod migrate up coastal streams to spawn during September and October, and both Kwigillingok and Hooper Bay residents attempt to harvest large amounts of this resource to dry for the winter. Women in both villages hook for tomcod along the edge of rivers, while men harvest them with nets. Kwigillingok men "beach seine" tomcod using aluminum skiffs and short nets upriver from the village. Hooper Bay men employ a type of "bagnet" to harvest these fish in the waterways near the village. Emphasis is placed on harvesting these fall fish, especially in Kwigillingok,

because the duration of each winter is uncertain and village residents wish to have enough food on hand to provide a buffer against resource failure both in the winter and the following spring, as has occurred in the past.

Women of both villages gather the assorted roots cached by rodents during the fall. Late berries such as the crowberry and lingonberry are also gathered. Also prime at this time are the various grass species that serve as insulation for boots, grass ropes for braiding fish to dry, and the raw material for various basketry items that women make during the winter that may be a major source of household cash income.

During the fall, Hooper Bay hunters occasionally harvest belukha, a resource distributed community-wide. These whales no longer occur in proximity to Kwigillingok. However, Kwigillingok hunters are usually able to harvest a few walrus during their fall migration. These animals also are distributed among the whole community.

The often stormy weather of the fall may prevent or impede resource harvest activities. Weather tends to be more unstable at this time with cold weather often interrupted by brief, unseasonably warm periods. Winds shift from day to day and temperatures drop enough to start the formation of ice. Freeze-up itself in some years is a rapid process, while in other years it lasts several weeks. Village residents noted that traveling conditions are risky during this period. It was necessary for many resource activities to be undertaken with caution and due respect for the dangerous environmental conditions.

CHAPTER 7

WINTER

ENVIRONMENTAL CONSTRAINTS

Winter on the coast is the longest season of the year lasting from freezeup until the start of break-up, usually late October to mid-March. It is a period of limited light, periods of cold temperatures with low chill factors, and snow and ice. The light dwindles at a rate as much as six minutes a day until the winter solstice is reached at which point there are only five hours and thirty-six minutes of daylight (National Weather Service, personal communication, July 1983). The mean temperatures for December and January at the weather service station in Bethel where Delta weather data are compiled are between 4.4 degrees and 5.1 degree Fahrenheit based on 30 year averages. The lowest recorded temperature was -46 degrees Fahrenheit. The average wind speed around Bethel in December and January is over fourteen miles per hour, which would make the wind chill temperature on an average day colder by around 25 degrees Fahrenheit or more (NOAA 1981). Along the coast it is generally windier than around Bethel, although the temperatures may be slightly warmer. Winter activities take place under these conditions of limited light, cold temperatures, sometimes high winds and excessive chill factors and blowing snow.

BIOLOGICAL CHARACTERISTICS OF WINTER SPECIES

Furbearers

The coastal areas around Kwigillingok and Hooper Bay historically

have not supported large terrestrial mammals such as moose or bear; however, the tundra provides habitat for various species of furbearers. Mink, land otter, weasel, red fox, arctic fox and two species of hare all can be found in the vicinity of these two communities. Beaver are also found here, but are relative newcomers within the past few decades.

Before historic contact furbearers were important for food and the raw materials for winter clothing. Beginning in the Russian period, furbearers assumed a new role as a commodity that could be sold or bartered for imported goods. The coastal areas of the Yukon-Kuskokwim Delta are reknowned for the high quality of the mink (Burns 1964). Trapping is still an active pursuit today in these coastal communities. Local furbearers are still harvested for home use as well as for sale on commercial markets. In the sections which follow, furbearer trapping and hunting are discussed by species.

Mink

Mink (Mustela vision), is probably the most important harvested furbearer in the coastal areas of the Yukon-Kuskokwim Delta because of the economic value of its pelt and its greater availability. A mammal that spends much of its time in or around water, the water-pocked tundra of the Delta produces some of the largest mink in the world (Burns 1964). Den sites are usually in the banks of small streams or other areas of deep annual thaw. Main food items in this area are probably small mammals such as rodents taken in the summer and blackfish during the winter. Mink in the Delta mate during April and have their young in June. The young leave the den when the family disperses in August and September and are available to be trapped by freeze-up (Burns 1964).

Around Hooper Bay, the tundra around interior portions of the Kashunuk River with its myriad streams and ponds supports some of the highest densities of mink in the Delta (Burns 1964). The coastal plain around Kwigillingok is not as productive as areas near Hooper Bay, perhaps due to the absence of major river systems. The rivers and sloughs draining this section of the coast are short in length and shallow, occasionally freezing solid.

Land Otter

The land otter (Lutra canadensis) is the largest species of mustelid inhabiting the tundra of the Yukon-Kuskokwim Delta. Like the mink, they spend a large amount of time in or about water. They are generally adapted to a fresh water environment, but are found in estuarine, brackish and marine environments as well. They are most abundant along coastal areas that are rich in food resources such as estuaries and the lower portions of streams. They are principally aquatic animals and major prey include abundant, slow moving blackfish, and birds. They usually travel by following water systems (Toweill and Tabor 1982). Land otter are generally less common than some of the other furbearer species in the Yukon-Kuskokwim Delta perhaps because of extensive winter ice and because the tundra environment is less rich in year-round food resources than other areas of the state.

Red and Arctic Fox

There are two species of fox in the coastal areas of the Yukon-Kuskokwim Delta: the red fox (Vulpes vulpes) and the arctic fox (Alopex lagopus). Both of these species are hunted and trapped by residents of

Kwigillingok and Hooper Bay.

Kwigillingok is at the southern limit of the arctic fox range and in this area, arctic fox are not as numerous as red fox. Along the coast north of Nelson Island arctic fox are generally more common than red fox. The arctic fox is a circumpolar species commonly found along the coastal fringe north of the Kuskokwim River and along the North Slope. They make short seasonal migrations towards the coast in the fall and early winter which is probably influenced by the scarcity of food inland. They show seasonal food preferences and prefer live food to carrion. Where arctic and red fox overlap, red fox tend to harrass the smaller fox species and can be a predator (Underwood 1982).

Red fox are generally not as numerous around the coastal area as arctic fox except around Kwigillingok. Red fox prefer diverse habitats and tend to utilize edge areas heavily, rather than large homogeneous tracts of land. They eat small mammals such as rodents, hare, mink, birds, carrion, and plant material such as berries, grasses and sedges. They den in the summer and disperse in the fall (Samuel and Nelson 1982).

Both red and arctic fox are subject to cyclical highs and lows in their population densities. Both are also carriers of rabies. Outbreaks of rabies occur usually when the populations are at their highest, posing health risks to local residents and dogs.

Seals

The three major seal species may remain off the shorefast ice of Hooper Bay and Kwigillingok throughout the winter. The ringed seal is the most common at this time. The spotted seal is present in lower densities and occasionally bearded seals are sighted. The residents of

Kwigillingok do not hunt seal during most of the winter as the ice conditions generally are considered too unstable. By February, some scouting for seals will have begun, as discussed in Chapter 4.

Limited hunting for seal during the winter occurs at Hooper Bay and some men retain kayaks or canoes for this purpose. Kayaks are considered more reliable in conditions of unstable ice and extreme cold water temperatures than skiffs with outboard motors.

Ptarmigan

Ptarmigan are year-round residents of the Yukon-Kuskokwim Delta. The most common species around both Kwigillingok and Hooper Bay are the willow ptarmigan (Lagopus lagopus). Rock ptarmigan (Lagopus mutus) are occasionally found in the area. Some ptarmigan nest around both communities during winter. However, usually by late fall and early winter, they migrate inland to avail themselves of larger willow groves away from the coast. By February, ptarmigan flock in large groups and many of these flocks migrate back towards the coast. In some years, they may not arrive in force on the coast until break-up.

Hares

There are two species of hares present along the coast of the Yukon-Kuskokwim Delta. The snowshoe hare (Lepus americanus) is the smaller of the two species and is less common in the treeless tundra of the coast. The tundra hare (Lepus othus) is considerably larger and restricted to treeless coastal fringe of Alaska's western and northern coast (Bethner and Rongstad 1982; Ernest 1978). Generally, hare are present around Kwigillingok and Hooper Bay throughout the year. They are principally

hunted in the winter. The densities of hare tends to be highest in areas of willow brush.

Tomcod and Smelt

After freeze-up, the ice on local rivers and ponds grows steadily thicker. In some areas, such as around Kwigillingok, these water bodies are shallow enough that during extremely cold winters, there may be little or no free water left. In areas of shallow water, the dissolved oxygen content is reduced considerably. After freeze-up the tomcod in the Kwigillingok River, Napayaraq River, and Akulakutuk Slough start migrating downstream. Most leave these systems by the end of December during an average year. They may exit before this time under conditions of rapid ice growth fostered by extreme cold temperatures. Boreal smelt (Osmerus eperlanus) also are present in the rivers after freeze-up. It is uncertain how long they remain within the river system. They occur in lesser numbers than tomcod and local residents do not fish for them after the tomcod are gone.

Whitefish

The distribution of winter whitefish varies in the coastal area. Residents of Kwigillingok reported that they were unable to fish for whitefish during the winter. Around Hooper Bay, several species of whitefish remain present in local stream systems throughout the winter. As noted for summer, certain species are more abundant than others. The Bering cisco (Coregonus laurettae) is the most abundant species followed by the least cisco (Coregonus sardinella). The other species that occur in lesser amounts are the humpback whitefish (Coregonus pidschian) and

sheefish (Stenodus leucichthys).

Both of the ciscos spawn during the fall. During the early winter they migrate away from the spawning areas (Morrow 1980). Around Hooper Bay, local residents note that the Bering cisco migrates down towards salt water whereas the least cisco tends to stay mainly in freshwater streams. After residing the winter in salt or brackish water near the mouths of rivers, Bering cisco start their spawning run in the late winter or spring months (Morrow 1980), and can be harvested using nets until the river ice becomes unstable and the nets are either removed or lost.

Blackfish

The blackfish (Dallia pectoralis Bean) is a small fish that principally inhabits the western and northern fringe of Alaska from Bristol Bay to Barrow. They are found around both Hooper Bay and Kwigillingok, but are probably more numerous around Hooper Bay. It is strictly a freshwater fish, usually found in streams and ponds where there is little or no salt water intrusion. Blackfish make short migrations during the year. During the spring and summer they move upstream to spawn, migrating downstream to deeper water in fall and winter. Blackfish are very hardy, able to withstand partial bodily freezing and low water oxygen content (Morrow 1980).

Needlefish

Ninespine stickleback (Pungitius pungitius Linnaeus, "needlefish") are tiny fish, usually less than 2.5 inches in length. They are a freshwater fish that can tolerate low oxygen concentrations. Coastal popula-

tions of this fish may winter offshore in the sea. Little is known about needlefish by biologists, but the seasonal migrations of this fish appear to be inshore toward shallow water in the spring to spawn and a return movement in the fall to deeper waters. Needlefish tend to school except when spawning and at certain times of the year they are very abundant (Morrow 1980).

Burbot

The burbot (*Lota lota*, "lush") is a species of codfish that resides in freshwater. It tends to frequent in deep-water areas of lakes and rivers. It usually spawns in the winter during which time the local population of a given stream system makes a concentrated spawning run upstream to shallow water. This spawning run and a post-spawning run to feed may represent the only period when this fish can be harvested in great numbers. Because of their habit of dwelling the rest of the year in deep water, they are less accessible for harvesting by most methods (Morrow 1980). Burbot are present within a few stream systems near Hooper Bay. However, they are not present near Kwigillingok. Kwigillingok residents procure these fish from relatives living upriver on the Kuskokwim River.

Northern Pike

The northern pike (*Esox lucius*) is another strictly freshwater species. It usually resides in deep water within river and lake systems. In late winter or early spring, pike migrate upstream to spawn in shallow marshy areas with emergent vegetation (Morrow 1980). Around Hooper Bay, pike are present in low to moderate densities in areas away from the coast. They are common in some streams and essentially non-existent in

others. During the spawning run, the local populations are more concentrated and are easier to harvest in a few specific locations. There are no pike present within the vicinity of Kwigillingok.

KWIGILLINGOK WINTER SUBSISTENCE ACTIVITIES

Trapping

Location and Timing of Harvest

Kwigillingok residents harvest fur bearers from an area stretching from the Kuskokwim River west to Dall Lake (Fig. 26). Residents reported that this area was used jointly with residents of the villages of Tuntutuliak, Kongiganak, Kwigillingok, Kipnuk and Chefornak. Certain species such as mink are harvested in specific areas closer to Kwigillingok, but residents traveling within this common use area are free to harvest any resources they might encounter. Kwigillingok residents start trapping for mink as soon as the land based ice is safe for travel. Most mink are taken in November when the fur is prime. Effort usually tapers off by mid-December. The regulatory season for mink is open from November 10 until January 31 (Alaska Board of Game 1982). The men stop trapping earlier because by mid-December, ice on the waterways has become extremely thick, making the reopening of holes difficult, and there are less daylight hours during which to work.

Kwigillingok trappers do not establish traplines. Rather they use specific areas for trapping mink and otter and broad areas for fox. Specific mink areas of Kwigillingok trappers are up the Kwigillingok coast to the west (Fig. 26). Men who actively trap mink will have their

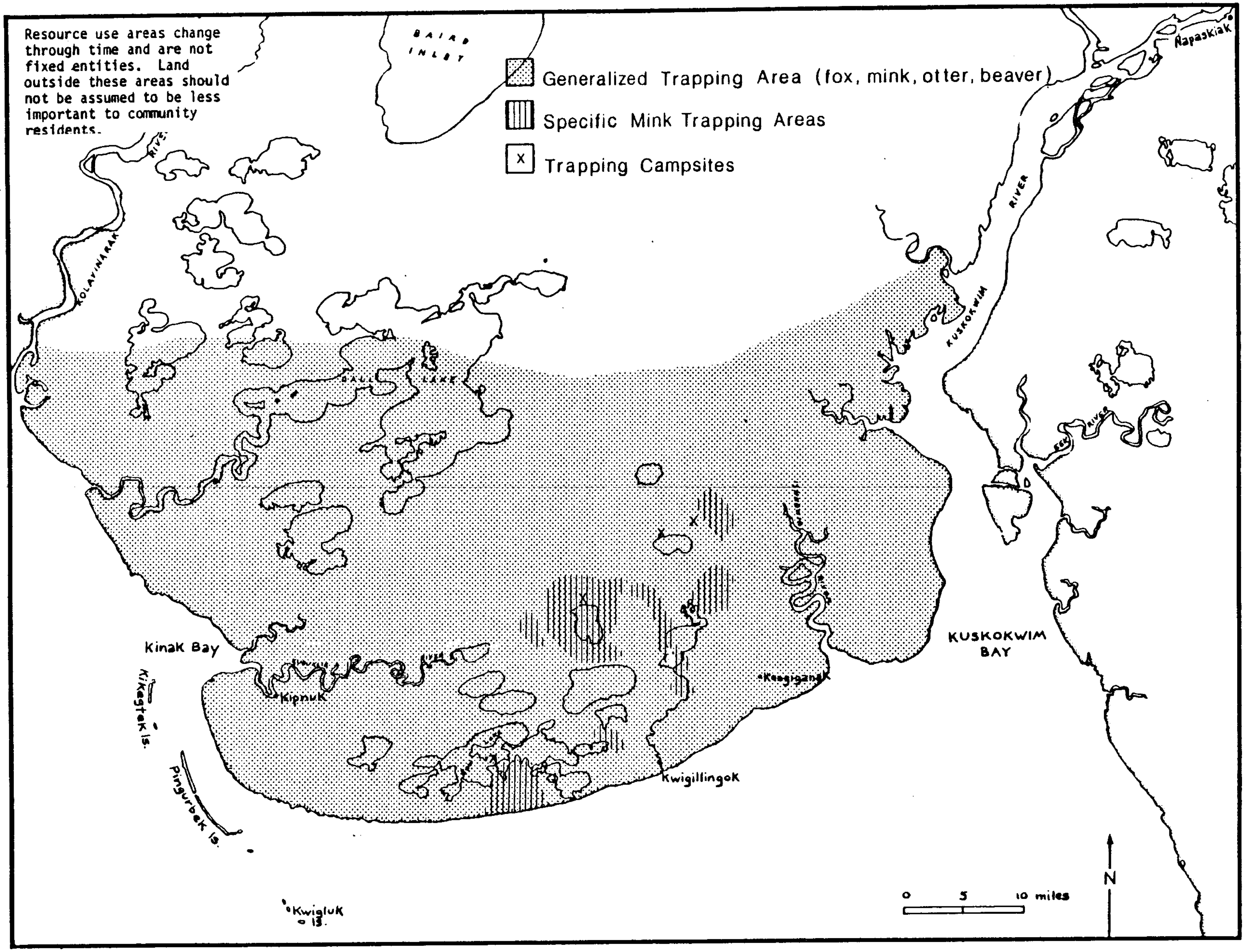


Fig. 26. Furbearers harvest areas of Kwigillingok residents, c. 1981-1983.

own discrete areas which they will use year after year. These areas are known and respected by other local trappers. Most men learned the use of their areas from their fathers. In the past, men would move out to their mink area to trap, but now operate from the village.

Land otter utilize similar habitat to mink, but are not as abundant in coastal areas. Like mink they travel along water ways, but they may also be encountered traveling across the tundra. The majority of otter are harvested during November through mid-December, within the same time frame as mink, and within the same trapping area as mink. Occasionally a land otter is taken at other times during the winter when they are encountered while traveling (Fig. 26).

Hunting for red and arctic fox takes place throughout much of the winter. The majority of red fox are taken from November until mid-December, while the peak harvests of white fox occur from February through March. The regulatory season is from November 10 to March 31 (Alaska Board of Game 1982). Red fox pelts are considered prime only through December; after this time most hunting ceases. Residents noted that white fox pelts reached their prime in February and March.

Fox hunting occurs throughout the use area depicted in Fig. 26. Because of the free-ranging nature of both fox species, men employ a search pattern that is non-specific in terms of habitat unlike mink, and harvest is opportunistic as the foxes are encountered.

Environmental Constraints

Trapping mink and otter is influenced by ice conditions since the most most effective trap for this area, the basket trap described below, are set in streams under the ice. The increasing thickness of the ice as

winter progresses makes reopening holes more difficult and time consuming and the decreasing daylight hours limits the time available to work. These factors, coupled with cold temperatures, makes mink and other trapping less feasible during midwinter, so the activity ceases.

Conditions of blowing snow and other hazardous traveling conditions prevents the hunting of foxes. These conditions also reduce the efficiency of spring traps, since drifting snow quickly obscure these implements. Spring traps are occasionally used by some people, but are not as efficient out in the treeless tundra of the coast because of these conditions.

Logistics and Techniques

Mink trapping is a male activity usually undertaken by the head of the household and occasionally older sons. In the past when men stayed out at trapping camps, they trapped with partners. These partners were often their seal hunting partners as well.

The principal gear used for harvesting mink is a basket trap called a taluyaq. Taluyaat used for mink are about 3 feet in length and are made of wood strips or wire mesh or a combination of both materials. A taluyaq consists of two parts: a funnel shaped mouth which is inserted into a larger cylindrical frame. Some men use box snares, but these are not as common. Other associated equipment for mink trapping includes an ice chisel or axe, shovel, and rope. Men travel to trapping areas with snowmachines hauling sleds.

Taluyaat are usually set in waterways underneath the ice, frequently in streams just at the outlet of a lake. Each place where a taluyaq is set is marked with willows or other material. The taluyaq is checked

every few days, necessitating reopening each hole in the ice in order to remove the trap.

Not all men trap, and of those who do, not all sell their furs. In the winter of 1981-82, about 12 men from Kwigillingok sold 423 mink pelts at an average price of $42 to buyers who traveled to the community (Alaska Department of Fish and Game, 1982; Burrows, pers. comm. 1983.). The number of pelts sold ranged from 3 to 123 pelts; the median number of pelts sold were six. The number of minks harvested and retained for local use is not known.

Land otter also are harvested in mink traps. Otters occasionally chew their way out of all wood taluyaq. Some men take otter with short nets with 5 inch mesh set under the ice. Associated gear and participants are similar to that described for mink.

Traps are not generally used for foxes because traps are not an effective means of harvest of these animals in the coastal areas where conditions of blowing, drifting snow occur. Most people use snowmachines for chasing foxes and light caliber rifles to dispatch the animals. Like mink trapping, fox hunting is done by adult males. The heads of the household that are active in mink trapping are often active fox hunters as well. Any male who is old enough to travel across the tundra during winter also may participate. Fox hunting occurs as an individual activity or in conjunction with other trapping, hunting, or fishing pursuits. Foxes are encountered on a opportunistic basis and pursued when they or fresh tracks are spotted.

Disposition of Harvest

The first steps in processing mink is usually the job of the trappers themselves rather than the women of the household. The mink are skinned

and then fleshed. The pelts are usually put on a stretching form, fur side in, and tacked down. Rolled up paper may be inserted in the legs so that they are filled out while drying. Pelts are dried in a warm spot in the house for a few days. After the pelts are dried, they are taken off the form and turned rightside out if they are intended for sale. If they are for home use they are put into storage until they are needed. Women are responsible for tanning the skins before use and fashioning them garments and crafts. Mink are often made into children's or women's parkas. They are sometimes used in the lining of hoods of small childrens' parkas especially if another type of fur or material is used for the body of the garment. Mink is eaten by many Kwigillingok residents either cooked fresh or after being "aged". Aging is done by putting the meat away for several days until it has started to sour. Mink is the major fur sold by Kwigillingok residents. Its sale may represent a major source of income for some households and an added source of cash for others.

Land otter is processed similar to mink. The carcasses are used for food cooked fresh or "aged". In 1981-1982, no pelts were reported sold by residents of Kwigillingok (Alaska Department of Fish and Game 1981-82). Otter pelts usually are retained for household use in the construction of winter garments, especially men's parkas.

Like mink and otter, fox pelts are fleshed, placed on a stretching form, and dried. Fox carcasses are never eaten, however. After the pelts are dried, they may be sold to furbuyers. In the winter of 1981-82, ten men from Kwigillingok sold 82 red fox pelts and two men sold 10 arctic fox pelts (Alaska Department of Fish and Game 1981). As with mink and otter, these figures do not represent the total harvest, because some

people retain fox furs for manufacturing winter garments. This is particularly true of red fox which are commonly used for lining the women's overblouse used in winter (called a kaspeq, atkuk). Women tan the skins and sew the garment. Arctic fox furs are used as lining or trim, but this is not as common.

Fishing

Tomcod

Location and Timing of Harvest

The fishing for tomcod (citurnaq, *Microgadus proximus*) after freeze-up takes place through holes places in the ice within a restricted area of the Kwigillingok River located at the lower limit of the village (Fig. 18). Ice fishing takes place as soon as the ice is solid on the river, reaching its peak by mid- to late November. The run of tomcod dramatically decreases throughout December as the fish leave the river. Tomcod are not harvested again until the next fall.

Environmental Constraints

The numbers of tomcod taken after freeze-up depends on the seaward migration. The timing of the run varies depending on growth rates of the river ice in any given year. During extremely cold winters, the ice develops and thickens quickly hastening the tomcods' seaward migration. During winters of slower ice development, the run will be of longer duration.

Most people fish when the tide is going out. When the tide is going out more fish are moving downstream making an efficient time to fish,

although the current may be strong. Fishing at low tide is poor and fishing when the tide is coming in makes the raising of the dipnet (described below) difficult because of the strength of the current.

November is a better time to fish than December because there are more daylight hours, the ice is generally less thick, and the weather conditions are not as extreme. Fishing does not take place on days with high wind because of low chill factors. Unseasonable warm periods during the winter can also lead to the thawing and loss of the frozen fish harvest.

Logistics and Techniques

Tomcod are harvested through the ice with use of large dipnets (qalu). The nets are usually six to eight feet in length, of small mesh size, and are attached to a rectangular metal frame. The frame is about 4 1/2 feet by 3 1/2 feet wide and has a handle 12 feet in length made from a 2" x 4" piece of wood reinforced by metal poles and rope wrapping running along the side.

As soon as the ice is solid enough to support the weight of snowmachines and people, a series of holes for the dipnets is cut in the ice at mid-channel. Each hole is nearly five feet in length and nearly two feet in width. An ice chisel or axe is used to chop the ice along the perimeter of the hole. The ice block is chopped into pieces and shoveled out.

On days with relatively good weather without wind, men operate the dipnets. As the tide is going out, they insert the dipnet through an open hole until it touches bottom. The men hold the handle upright the whole time the net is in the water, bracing it against the current as they feel the tomcod moving into the net. After enough tomcod have made

their way into the net, the men pull the net up through the ice. The dipnet is reinserted one or more times until the fishermen have reached a desired harvest.

Because the dipnets are so large, men usually operate them. It takes at least two men to pull the net back up through the ice. However if the current is strong and the fish harvest large, it may require more men to pull up the net. Usually men from the same or closely related households fish together, although anyone who is present on the river ice helps pull up the net if necessary. Dipnets are shared among relatives.

An alternate method of harvesting tomcod through the ice is to use hooks and lines, or "jigs". Jigs consist of short poles with a variable length of string attached and usually a treble hook or multiple single hooks on the free end. A small lead weight is usually positioned just above the hook(s). The hooks may or may not be baited. Smelt is commonly used as bait. Accessory gear may include an ice-chopping implement such as a chisel or axe, and some sort of ladle to remove ice debris from the hole.

Women are the principal participants in the jig fishery. Women older than 20 and not employed full-time usually fish for tomcod. They fish individually or with other women who are close relatives.

Women who jig may use the dipnet holes if they are not being used or make separate smaller holes. Enough line is let out so the hook dangles a few inches above the river bottom. The pole, is held and jigged intermittently, or planted into an ice mound on the side of the hole. In the first method, a person feels if a fish bites the hook, pulling the line up rapidly. In the second method, the line is watched for any changes in tension indicating the presence of a fish. The line is pulled up quickly

and fish on the hook deposited on the ice besides the hole. If the hook was baited, it may be rebaited before being dropped into the water again. The women stop jigging just before low tide as the success rate drops dramatically at this point.

Disposition of Harvest

Tomcod are eaten fresh, frozen, or dried. Fish that are harvested by dipnet or jigs in early November may be split and braided with grass ropes to be dried if the temperatures are still mild. However, as November progresses and the weather gets increasingly colder, most of the harvested fish will be placed in burlap bags or cardboard boxes and left on the ice to freeze for a few days before being retrieved and stored.

The dipnet harvest usually provides for each household's needs. Sometimes tomcod are given to people who come down to the river. Many families share stored frozen or dried tomcod with relatives in Kipnuk and Kongiganak. Tomcod are also shared with the many visitors that come to visit during the ceremonial times of mid- and late winter such as at Slaaviq and during church rallies. Tomcod are considered essential for the successful winter survival of the community, because as one person noted, the village residents can never be sure when break-up will occur and whether the seal harvest of the upcoming spring will be successful. Kipnuk has a small run of tomcod, but the local streams appear less amenable to the use of dipnets and most people rely on hooking. In Kongiganak, tomcod have been noted in the local river only within the last few years. The run is small here and the river not amenable for the use of dipnets. Consequently, some Kipnuk and Kongiganak residents come to Kwigillingok and dipnet for tomcod.

Tomcod are a major winter resource despite their short term availability. It is not unusual for active fishing families to store more than 40 strings of tomcod (with a minimum of fifty to seventy-five fish per string) and over 10 burlap bags of frozen tomcods. Occasionally during extremely cold winters, the harvest of frozen tomcod is extremely small, probably due to the early exit of the fish from the river. This is viewed by local residents as an adverse occurrence.

Blackfish

Location and Timing of Harvest

The harvest of blackfish takes place in areas north and northwest of the Kwigillingok River and in the general vicinity of Bow Lake west of the village (Fig. 18). Blackfish traps are usually placed in streams with a current, often near the outlet of ponds. Some men place their blackfish traps (taluyaq) in the area where they set taluyaq for mink. Other men may set their blackfish trap(s) in an area that may be unrelated to their trapping endeavors.

Blackfish taluyaq are set as soon as ice is safe for traveling, sometime after freeze-up. Some locations may be productive only through mid-winter while other locations may remain productive until close to break-up.

Environmental Constraints

The major environmental influences affecting the harvest of blackfish is growth of surface ice during the period from freeze-up through December. Although adapted to withstand conditions of low water dissolved

oxygen conditions, if extremely cold weather and a rapid growth of surface ice coincides with the blackfish downstream movement, the blackfish may be forced to seek deeper water in an area where shallow water systems are the rule. The thicker ice of extremely cold winters may make blackfish less accessible as well. These conditions can lead to a poor harvest of this winter species.

Logistics and Techniques

The residents of Kwigillingok harvest blackfish with the use of large basket trap (taluyaq). The taluyaq used for blackfish are often 6 feet in total length and made from wood strips, wire screen, or a combination of both. The "body" of the trap is a large cylinder that is often two feet in diameter and open in one end. The mouth of the trap is funnel-shaped, up to 3 feet in length, usually around 2 feet at its widest diameter and only a few inches at its smallest. This funnel is inserted into the open end of the trap as the entrance. Associated gear used for setting and checking the trap include ice chisels, axes, large ice ladles, and shovels.

In Kwigillingok, the head of a household usually makes and sets the blackfish traps as long as he is physically active. Men may work alone or they are accompanied by sons or other male relatives.

Blackfish are set in streams often near the outlets of ponds and lakes. Streams with strong current will not be selected because debris in the trap becomes a problem. A large hole (4' x 4') is cut in the ice with chisels and the ice chunks and debris removed with shovels and the large ice ladle. The trap is lowered into the hole so that the opening faces upstream. It is secured in place by rope attached to the rim being tied to a willow marker is planted on the surface of the ice beside the

hole. It may be necessary to reset the trap in several locations until a productive area is found.

Disposition of Harvest

Blackfish are eaten frozen or boiled. Blackfish have the ability to survive a few days after harvest if kept in a tub with some water. In this fashion, they can provide fresh food over several days. This makes them a valued commodity during the winter months when fresh food is difficult to procure. They also are eaten frozen with seal oil. Most households have access to blackfish either by setting their own traps or from relatives who set traps.

Needlefish

Needlefish constitute a minor part of the Kwigillingok food supply although in the past they had a larger role. Needlefish can be harvested from the Kwigillingok River after freeze-up by cutting holes in the ice near the bank and using small dipnets. However, most people who want needlefish usually receive them from relatives in Kipnuk where they are more numerous. In the past when people maintained dog teams, fishermen would travel to the Kipnuk area to harvest large quantities of the fish for dog food. Currently, with the absence of dog teams and the presence of stores to provide a buffer against winter starvation, most people do not actively fish for needlefish. Some households may not eat any needlefish during a winter, while other housholds eat them relatively frequently. Older people stated that they liked to eat needlefish a variety of ways. Some let needlefish sit in a container of water in a warm place to ferment for a few days before eating them boiled with seal oil. Another

method of eating needlefish is to add them into a soup base made up of seal blood ("blood soup").

Small Game Hunting

Location and Timing of Harvest

Ptarmigan are usually hunted in late winter and early spring as they return to coastal areas. For much of the winter, the limited vegetation and drifting snow usually results in little or no food for ptarmigan right along the coast, forcing them to move farther inland. During early winters of limited snow conditions, it is possible that a few ptarmigan linger around the coast until deeper snows come. However, during winters of persistent snow conditions and cold temperatures such as the spring of 1982, the ptarmigan may be delayed in their return to the coast.

Ptarmigan are hunted along the coast between Kongiganak and Kipnuk (Fig. 9). Another area that is hunted is near the headwaters of the Ishkowik River (Fig. 9). This area has extensive willow groves and is a prime spot to hunt for ptarmigan in late winter. People who travel between Kwigillingok and Tuntutuliak intercept ptarmigan flocks in these willow areas.

Environmental Constraints

Although ptarmigan remain year-round residents in the Delta, their seasonal migrations render them virtually inaccessible to the people of Kwigillingok during most of the winter. When they do move into the general vicinity of the community, their flocking behavior makes them relatively easy to hunt. The weather conditions of each winter affects

the timing of their migrations. During cold winters with extensive, persistent snow cover, ptarmigan may move in force back to the coast several weeks later than normal.

Logistics and Techniques

Ptarmigan are usually hunted using snowmachines for access and shotguns of variable gauges. Some men set snares in areas of willow brush. Men of all ages hunt ptarmigan, by themselves or with others. Ptarmigan hunting is done on its own, or in conjunction with other activities on the tundra such as the hunting of hares. Men traveling by snowmachine between Bethel or Tuntutuliak and Kwigillingok sometimes take time to hunt the willow groves lining the Kuskokwim River bank and below Tuntu tuliak.

Disposition of Harvest

Ptarmigan are eaten fresh in soups or dried for later consumption. The initial harvest of ptarmigan, if small, is eaten fresh. As more birds are harvested, they are dried. Some people dry large quantities of these birds, noting that dried ptarmigan is tasty food in the summer. Ptarmigan thus fill two roles. They are a source of fresh meat at the end of the winter when other food supplies are dwindling, and they provide a source of dried meat in the summer, when fresh foods make up the bulk of the diet.

Hares

The two species of hare present in the area around Kwigillingok are hunted throughout the winter. The peak of hunting seems to occur in the

late winter months when available daylight has increased and men have started actively hunting ptarmigan. Hare are found in varying densities in the hunting and trapping area described for mink, but their densities may be highest around the willow brush a few miles northeast of the village in the direction of Tuntutuliak. Since hare move widely across the tundra hunters usually employ a broad search pattern similar to fox hunting, using snowmachines and small caliber rifles. Some men also set snares in areas of willow brush. Generally the same people who participate in fox and ptarmigan hunting also hunt for hares. Hares are not actively hunted during the summer as they are considered unpalatable at this time.

Hare are skinned similar to foxes, fleshed, stretched, and dried. Hare pelts are rarely sold. They are used to make inner skin garments, but the pelts are described as being very fragile. The meat is commonly cooked in soups. Tundra hare may weigh up to 12 pounds, so the harvest of this species can provide significant amount of fresh meat. This is one of the few available land mammals that the local residents can use for food. Its availability in late winter helps offset the dwindling food supply as well as provide a source of fresh meat.

Wood Gathering

Location and Timing of Harvest

Gathering driftwood takes place throughout the winter. This activity begins after freeze-up as soon as the ice is solid enough to support the weight of snowmachines and sleds and continues until breakup when traveling conditions deteriorate. People search for wood during the winter

with varying intensities.

The principal location for wood gathering during the winter is along the coast east of Kongiganak and slightly up the Kuskokwim River near the mouth. This area commonly contains the largest supply of driftwood. Some gathering also takes place along the coast below and west of the community.

Environmental Constraints

As noted in Chapter 5, the availability of wood in the treeless portions of the Yukon-Kuskokwim Delta is determined by the amount of deposition that occurs following the break-up of river ice. Each year the amount of driftwood varies.

Travel conditions during the winter affect the ability to gather what wood is available. Periods of thaw and the resultant wet snow conditions may make traveling with heavy load unfeasible. Blowing snow conditions also make travel difficult, and hazardous. Because men must travel extensive distances to gather wood, they usually choose to travel only under conditions that are safe, no matter how limited their wood supply is.

Logistics and Techniques

Men take axes and/or chainsaws, shovels, ice chisels and ropes on the snowmachines and sleds as gear for gathering driftwood. In the past, long probes were used to help locate the wood under the snow. Elder residents reported that these are no longer essential as current winter snow depths are less than occurred in the past, probably due to a general trend toward milder winters.

The male head of a household does the gathering if physically able, or it may be delegated to sons who have taken over many of the household tasks. If wood is gathered for use in communally used steambaths members from each participating household procure the necessary wood.

Men gather driftwood when their supply is low and traveling conditions are feasible. When driftwood is located, it is freed from the snow and ice with the chisel and shovel. It is put on the sled as is, or cut into a manageable size for transport.

Disposition of Harvest

Most of the winter driftwood harvest is used to fuel the several steambaths in the village. Some people also use driftwood as a raw material to carve ladles, make hunting implements, whittle slats used to make the funnel mouths of taluyaq, and occasionally as structural material for sleds and other items. The consumption of wood in steambaths is great during the winter. Most steambaths are used a few times each week by households that own or share one. Only a few houses have wood stoves at this time.

HOOPER BAY WINTER SUBSISTENCE ACTIVITIES

Trapping

Location and Timing of Harvest

Several species of furbearers are harvested by Hooper Bay residents--mink, land otter, red fox, and arctic fox. Most mink are harvested in specific areas that are regularly used by one or more related households. For many of the older trappers, a trapping area has been used for much of

their productive lives. Some trappers have shifted their areas for various reasons, such as choosing to be closer to Hooper Bay or being dislocated by the creation of the new site of Chevak. After selecting an area, trappers tend to use it on an annual basis. Some trappers have constructed a permanent cabin in the area where they trap while others operate out of a temporary tent camp. Some now trap using the community as a home base. The areas used by older men tend to be associated with areas near where they or their parents resided prior to moving to Hooper Bay, such as the Kashunuk River and Askinuk Mountain area. Areas which were once used for trapping extended as far east as the Ingatsluwat Mountains, small cinder cones over 70 miles southeast of Hooper Bay (Fig. 27). The map indicates the use areas of the sample households and not the entire furbearer use area for Hooper Bay. The use areas of Hooper Bay residents are interspersed with those of Chevak residents with whom they are related. Outside of these trapping areas, a small harvest of mink occurs on an opportunistic basis as the mammals are encountered.

Trapping for mink takes place after freeze-up through December during normal years. Some people move to camp before freeze-up and remain there for two months or more. Others wait until after freeze-up when the ice is safe to travel before going out to their area. Some stay only long enough to set their traps, operating out of the village during trapping season. By the middle of December, mink trapping is essentially finished, although some people living out at mink camp may remain there until the end of December. The regulatory season for mink trapping is from November 10 until January 31 (Alaska Board of Game 1982).

Land otter basically utilize similar habitat to mink, are harvested in the same areas as mink. A limited harvest also occurs as they are

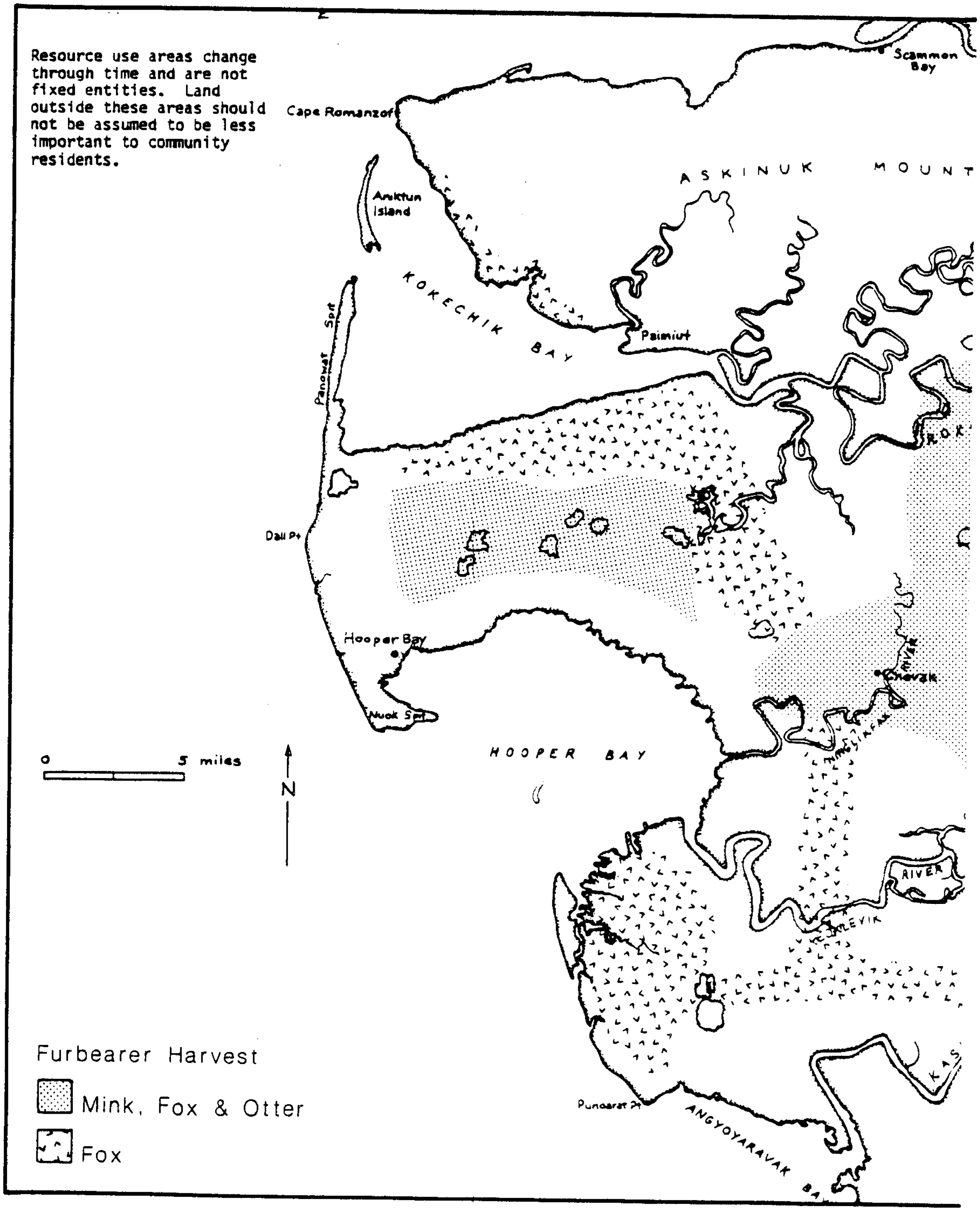


Fig. 27. Mink, fox and otter harvest areas of Hooper Bay residents, c. 1981-1983.

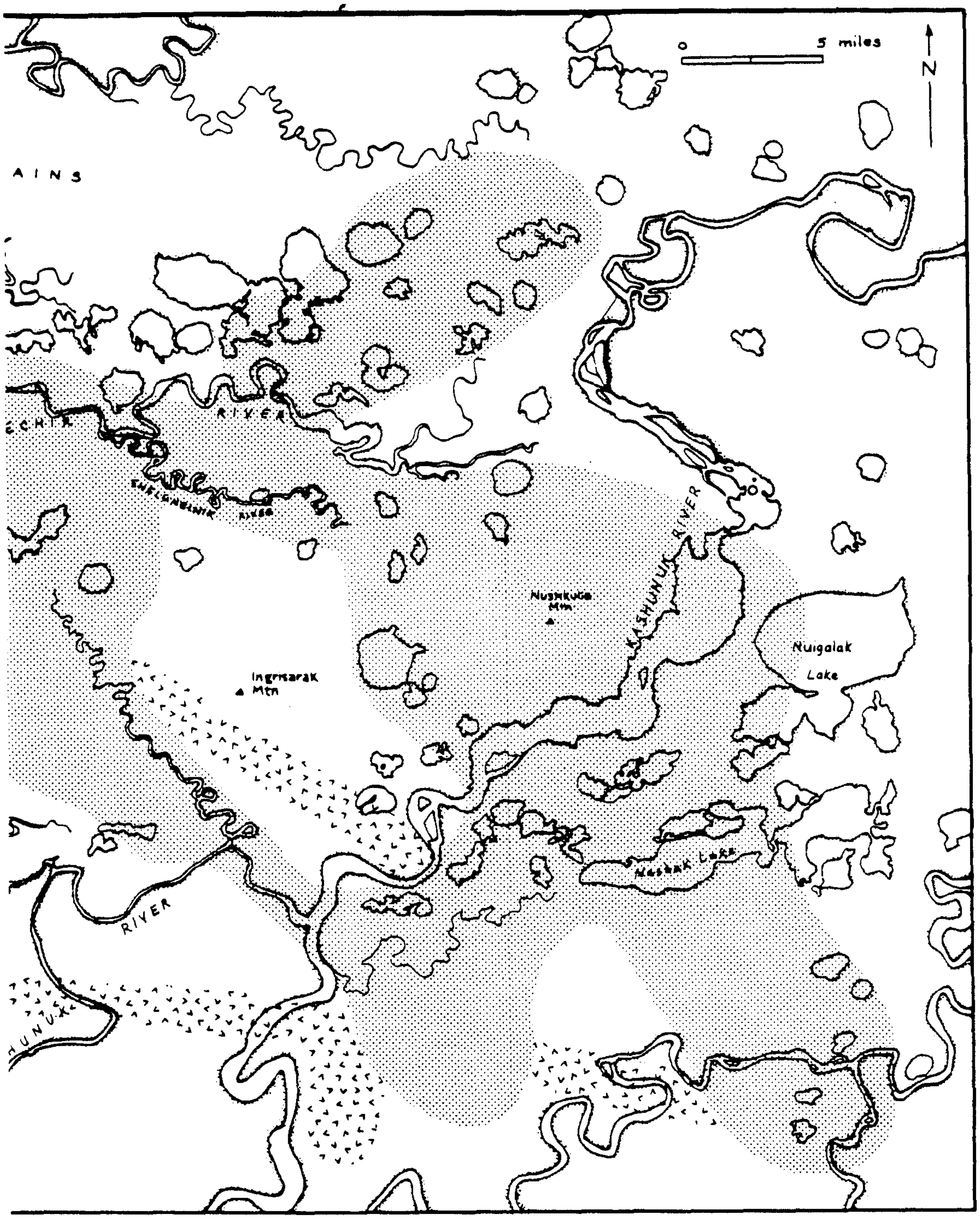


Fig. 27. Continued

encountered on the tundra. Like mink, they are taken from freeze-up to mid-December.

The hunting or trapping of red fox and white fox takes place in a much more opportunistic fashion than does the trapping of mink and otter. This is largely because the animals do not confine themselves to waterways, but range over the tundra in search of food. Areas searched for fox tend to be extremely large and are commonly hunted by many men. Snowmachine trails are commonly searched areas. Fox hunting areas include the coastline of Hooper Bay, the plateau north and east of the village, Paimiut and the Askinuk Mountains, the Manokinak River area, and the area as far as the Ear River near Scammon Bay (Fig. 27).

Most hunters search for fox when the pelts are prime. For red foxes, hunters noted that the prime period is in early to mid-winter (November to December). White fox pelts reach their prime from January through March. The legal trapping season for both species is from November 10 through March 31 (Alaska Board of Game 1982).

Environmental Constraints

Weather and ice factors play important roles in fur populations and trapping patterns around Hooper Bay. Many older trappers noted that furbearer populations tend to be cyclic so that some years are better than others for trapping. Environmental conditions which affect denning success such as cold wet summers can negatively impact the local mink population to some extent.

The cessation of mink trapping by mid-December is dictated by ice and climatic conditions. Trapping can be delayed by a slow freeze-up. Freeze-up can be a relatively rapid process over a period of a week or it

can extend over several weeks. Snowmachine travel starts once there is snow on the ground, but long distance trips to winter camps and trapping areas are not made until ice on river and lakes is secure and safe to cross. Surface ice continues to thicken as winter progresses, and the thick ice which has formed by mid-December signals the close of mink trapping season. By this time, available daylight has dwindled to less than six hours and temperatures and associated wind chills are cold. Active trappers noted that by this time the ice is too thick to work with given the other conditions. Despite the fact that the legal season is still open, environmental conditions make trapping too difficult and trappers discontinue their efforts. The conditions that influence mink trapping also affect the harvest of land otter.

Factory-made traps and snares are not used by many trappers in the coastal area for trapping fox because they are ill-adapted for local conditions. The continually blowing snow buries traps, making them inoperative or impossible to find. Because of this problem, they require a lot of care and constant rechecking which is not always feasible nor efficient. For these reasons, most people prefer to search for foxes, often enroute to other activities. Weather factors such as extreme cold, blowing-snow, and limited light influence when the men go out for fox.

Logistics and Techniques

Most active mink trappers in Hooper Bay predominantly use the _taluyaq_, a homemade trap that incorporates a funnel style mouth that leads into a larger chamber. The funnel mouth is made out of many slender wood slats whittled from driftwood. While the opening may be as much as a foot in diameter, at the end of the funnel the exit is only a couple of

inches in diameter. The funnel operates on a one-way principle: it permits the mink to enter the chamber, but the jagged points of the exit prevent it from escaping. In the past the body of the trap was constructed of wood, but many people now choose to make this part out of chicken wire or similar material. Some people also make the funnel mouth out of wire, but the wooden funnels seem to be preferred. Most taluyaq for mink trapping are about three feet in length. It requires a full day to make one. Some active trappers set about 50 of these traps during the season in their trapping areas. They are placed in streams under the ice and checked on a regular basis.

Other gear includes a snowmachine, shovels, ice chisels, and ice ladles. Mink are placed in burlap bags, plastic bags or boxes. A sled is used to haul all the accessory gear, plus assorted tools and food. Men who trap from a camp and stay for extended period of time, take additional gear like blackfish traps, whitefish nets, guns and other supplies to procure wild food while at camp.

Most men with trapping areas usually have partners with whom they trap. As with spring seal hunting partnerships, the partnerships involved in mink trapping tend to be stable through time. Some men have trapped with the same partner for the majority of their productive lives. When sons grow older, very often they will be incorporated into their father's partnership, assisting the older men. Although partners from different households camp together and use the same general area, they have their own set of traps and trap independently, unless they physically need assistance.

Depending on the number of traps to be set, one or more days may be necessary to initially place the traps under the ice. Traps are set on

small streams and sloughs that feed into a larger water body and are distributed along a circuituous route which can be checked in a day's travel. After a trap is set, some men place pieces of plywood or other material on top of the hole and fill the rest of the hole with snow to prevent the ice from becoming too thick between checks. Men who trap from camps commonly set a blackfish trap and a whitefish net in the vicinity of their camp which they also check regularly for fish for consumption while at camp.

The principal gear used for fox trapping are .22 caliber rifles and snowmachines. Once a fox or its fresh tracks have been sighted, the snowmachine aids in the pursuit of the fox. When close enough, the gun is used to dispatch the animal. A backpack or sled is usually desired to carry back any animal taken. Fox hunting is undertaken by individual men or several men together. The latter usually occurs when a fox is encountered while several men are out to check their mink traps, blackfish traps, or whitefish nets. Males who are old enough to operate snowmachines and who know the area around Hooper Bay well, hunt fox.

Disposition of Harvest

Mink that are harvested are skinned, either at camp or back in the community. The men often skin and stretch the pelt for drying while women tan the skins that are retained for household use. The mink are skinned by making only a small hole at the anus and cutting around the paws and the mouth. The skin is essentially peeled off the body. The skin is then inverted and stretched over a drying form, and all extra flesh and fat scraped off. The skin is tacked onto a form to prevent it from shrinking and some paper-like material is stuffed into the legs

to hold the skin upright and taut. The skins will be dried inside the house. When they are completely dry, they are taken off the form and again reversed so that the fur side is on the outside. Some mink pelts are retained by the household to make parkas or as trim, however most are sold. The meat is eaten cooked either fresh or after it has been "aged" for a few days.

According to for sale records, during the winter of 1981-82, 38 trappers from 36 households sold a total of 895 mink (Alaska Department of Fish and Game 1982). The size of individual sales ranged from one to 271 pelts; fifty percent of the trappers sold less than six pelts. The Alaska Native Industries Cooperative Association (ANICA) store was the predominant buyer in Hooper Bay, although one of the school teachers bought a limited amount of fur. The average price for a prime pelt was around $42 although prices vary considerably depending on the size and quality of each pelt. For many trappers, mink trapping represents only a small cash supplement to their household income. For the very active trappers, it can represent a major source of income for their family. Records of mink sales only represent a portion of the mink harvest. An unspecified amount of harvest is retained by households for their own use and does not have to be reported.

Like other furbearers, otter are usually skinned, stretched and dried by the trappers themselves. Otter meat is often eaten after being boiled. According to fur sale records, in the winter of 1981-82, only 10 otter were sold by eight households in Hooper Bay (Alaska Department of Fish and Game 1982). The amount of harvest retained for household use is not known. Like fox pelts, otter are commonly tanned and made into fur parkas by women. It normally takes four to six pelts to make a parka

depending on the size. The parkas for men and women have different styling and decorations. In general, the harvest of otter is small in comparison with mink and fox. Because of limited harvest, the sale of the pelts represents at best a small cash supplement. The chief value of otter is as a raw material for parka construction and as an occasional food item.

Red fox are sold or retained for household use, while arctic fox are primarily sold. Men skin, flesh, and dry the fox skins, women tan the furs retained for home use. Fox carcasses are never eaten. Red fox pelts retained by the household are usually used to make fur parkas called atkuk. Arctic fox skins are not usually used for parkas but are used as trim.

According to fur sale records, in the winter of 1981-82, 79 red fox pelts were sold by 24 trappers in Hooper Bay (Alaska Department of Fish and Game 1982). The median harvest was two pelts per trapper although one trapper took 14 fox. The average price paid for a red fox pelt that winter was around $62 (Burrows, pers.comm. 1982). Ninety-two arctic fox pelts were sold by 19 trappers (Alaska Department of Fish and Game 1982). The median harvest for arctic fox was also two pelts. One trapper sold 29 pelts. The average price paid in the Delta that winter for arctic fox skins was around $25 (Burrows 1982). Fox provide an extra source of cash and sometimes raw materials, but they are not as large a cash source as are the mink. Because they require a greater search area with less chance of success, they cannot be harvested as efficiently.

Fishing

Tomcod

Location and Timing of Harvest

As noted in Chapter 6, during fall tomcod move inshore and migrate up streams to spawn. After freeze-up, the fish start migrating downstream again. Most of the harvest after freeze-up takes place in the Napayaraq River and upper portion of the Akulakutuk Slough near the "housing" section of Hooper Bay (Fig. 25). It usually occurs until late November; after this time the surface ice has usually become too thick.

By March or April, tomcod migrating back to the deeper water run along the shoreline under the shorefast ice around and north of Nuok Spit, along the edge of Cape Romanzof. Some people occasionally go to this area or as far as Cape Smith in Scammon Bay to harvest them, as long as the shorefast ice remains stable and safe.

Environmental Constraints

Tomcod are fished in areas near the village which have little tidal influence and current. By December, it is no longer efficient to harvest tomcods and the fishing ceases. By this time the ice in most sloughs and ponds has become extremely thick, making the task of opening and maintaining ice fishing holes difficult. In the shallower sloughs, the ice may freeze solid with a joining of the heavier saline-impregnated ice with the upper strata of freshwater ice. As this occurs tomcod move downstream to deeper water, generally areas of greater current and tidal influence.

The major condition governing the harvest of tomcod in March and April is the stability of the shorefast ice. To harvest this run of tomcod, it is necessary to stand near the outer edge of the shorefast ice, which is generally the thinnest portion. In March right before break-up, it is especially prone to instability. People noted that tomcod fishing was hazardous at this time and extreme caution was exercised in fishing.

Good conditions for late winter hooking of tomcod include other factors besides safe ice. People noted that the ice should not be too thick, otherwise it is difficult to cut holes. Some people take advantage of stable cracks to make holes. It is better to fish at low tide when the water is not too deep. Days of blowing snow are avoided because it is uncomfortable to spend prolonged periods outside under such conditions and the drifting snow also packs the ice holes.

Logistics and Techniques

The handline or jig described earlier for fall tomcod fishing is the same equipment used for hooking through the ice in winter. Besides bait and some kind of carry bag, the other gear used in the winter includes an ice chisel, a slotted ladle or scoop to remove ice and slush from the hole, and something to sit on, such as a burlap bag or piece of cardboard. Women of nearly all ages are the sole particpants in tomcod fishing near the community in early winter. During the sea ice fishery in March and April, men are the major participants.

Jigging for tomcod is usually done by chiseling out a hole in the ice that is usually not more than a foot in diameter. An ice chisel is used to make the hole and a scoop or ladle is used to remove ice fragments

and slush ice from the hole. This ladle or scoop is used to remove ice and slush that forms while fishing. When the hole is free of ice, the fishing line is lowered until it touches the bottom, whereupon it is pulled up about six to eight inches above the bottom and the line secured at this length on the pole. The person fishing then "jigs" the line intermittently. If a tug is felt on the line, the line is pulled in. Fish are stunned with a small stick and left on the ice to freeze until fishing is over.

The bagnet used during the fall fishery is also used during November and mid-December. As in the fall the participants in this fishery are men. A large hole greater than 6 feet long and 2 feet wide is made in the ice. The bagnet is pushed into the hole until the two posts attached to the side of the nets opening are secured in the mud. In this position, the net rests a few inches above the river bottom. The net is left in the stream for a short time, usually less than an hour, before being pulled out by two or more men. The net will be reinserted as many times as desired.

Disposition of Harvest

Tomcod harvested during winter are eaten fresh by boiling or are frozen. Frozen fish are usually sliced into pieces and dipped in seal oil. Tomcod eaten this way serve both as meals and as snacks during the day.

Blackfish

Location and Timing of Harvest

The harvest of blackfish takes place predominantly during the winter, although there is a limited harvest that takes place during berry camp

and fall as described in Chapter 6. In the winter, men who stay at a trapping camp usually set a blackfish trap to obtain food while camping. Many families who stay at the community all winter also put in traps. Most freshwater streams and ponds near Hooper Bay where there is no salt intrusion have blackfish. Some sites are only productive until December or January, while others remain productive from freeze-up until just before break-up in April.

Common areas used for blackfish are stream and lake systems around Ingrisarak Mountain, especially the Ukalikchik River drainage, streams southeast of the Kashunuk River, south of the plateau near Chevak, and around the Paimiut area (Fig. 25).

Environmental Constraints

Blackfish remain entirely within freshwater systems, and in fall and winter move downstream into areas of deeper water. Some local residents noted that occasionally blackfish that spawn in fairly deep ponds will not migrate. People put their traps in streams, sometimes near the outlet of ponds. Locations vary in productivity. In some locations blackfish are able to remain all winter. While in others, blackfish can only be harvested until December or January after which time the blackfish will have migrated out of the area. By December, both the harvest and size of available blackfish dwindle in many locations. During early winter, large blackfish can range up to 10 inches in the Yukon-Kuskokwim Delta (Morrow 1980).

Other environmental considerations are climatic factors, such as blowing snow and cold temperatures that influence the activity of the fishermen themselves.

Logistics and Techniques

The major gear used to harvest blackfish is the blackfish trap or taluyaq, similar in design and construction to the mink trap but a larger version. It is usually at least six feet in length and the funnel mouth will be almost half the total length with a mouth over two feet in diameter. Like the mink taluyaq, the trap is made entirely of wood strips or of chicken or similar wire, but the most common construction uses both materials: a mouth and funnel made of wood strips and the body of the trap made of wire.

Blackfish traps are usually set some distance from the village. Before freeze-up a boat is used for transportation; after freeze-up, snowmachines with sleds are used. Ice chisels are used to open a hole in the ice for inserting and checking the trap. In addition, a large home-made ice ladle that is slotted on the bottom is used to remove the ice and slush from the hole. This large ladle usually has a long handle about six feet in length and a basket that may be at least eight inches in diameter. Because of the large size hole that is necessary to set the blackfish taluyaq, a large ladle is necessary to remove the great amounts of ice debris that block the hole. Some fishermen use a rock or other suitable weight placed within the body of the trap so it is not carried or twisted by currents and so it does not float and become frozen into the ice.

When a site is selected, a large hole capable of receiving the trap is made. This hole may be 4 feet square or similar dimensions. The snow is cleared, often by shovel, and the ice chipped away by the ice chisel. A shovel may be used to clear away the ice debris from the upper strata of

ice. Once water is reached however, the ice ladle is used. Once the hole is made, the trap will be lowered into the water and carefully positioned so it faces upstream. Willow brush is cut and "planted" in the snow on the edge of the hole, braced by snow and ice so it will not move. This willow serves two functions: it acts as an anchor for the trap which is attached by rope. It also acts as a marker so that the spot can be found again if the hole is drifted over by snow. After the trap is lowered into place and secured, the plywood is placed over the hole and snow shoveled back on top to prevent new ice from freezing too thick.

Men are usually the only participants in making and using blackfish traps, although women occasionally accompany the men to check traps. The man responsible for most of a households' food usually makes and uses the taluyaq. It is common for two men from the same household to go out to check the trap.

People who set more than one trap usually set them in the same stream system, often in close proximity. Occasionally blackfish traps will be set near a households' whitefish net. This enables the fishermen to check several sites on one trip. Traps are checked every three or four days weather permitting and more often if there is a heavy run of blackfish. When the run is heavy, some people can harvest 50 pounds in three traps in one day.

Disposition of Harvest

Blackfish harvested from a trap are transported home. A portion of the harvest is put in a large tub of water and kept inside the house for a few days. Because of their ability to withstand low oxygen, blackfish

can survive for at least 24 hours in a tub and some may live for as long as three days. These blackfish are eaten fresh after they are boiled. People usually eat the whole ungutted fish, except for the bones.

Blackfish are also frozen and eaten raw with seal oil. Eaten raw in this fashion, they are served as a meal or a snack. Since many households maintain traps, the harvest is usually retained with the household. However, sharing commonly takes place with relatives who do not have a trap set.

Blackfish is a staple winter food for many households and has always been a significant resource in the winter economy. As one elder person noted, in the past, blackfish was the single most important source of winter food followed by needlefish. Blackfish is still a common part of the winter diet and is a source of fresh and frozen food in the winter.

Whitefish

Location and Timing of Harvest

The most commonly used areas for setting whitefish nets is the Ingaklluk area near the Askinuk Mountains (Fig. 28). Bering and least cisco are the most commonly harvested species, but some sheefish and humpback whitefish are also taken. This relatively discrete but productive area is used in common by residents of Hooper Bay, Scammon Bay, and Chevak. In mid-December 1982, there were over 30 net sites in this area and another area nearby contained 10 nets. The Ingaklluk area has been in continual use by at least few families throughout time. With the advent of snowmchines, more families have set their nets near the mountains. Prior to snowmachines most net locations were on streams feeding into Hooper Bay and streams near mink trapping camps around

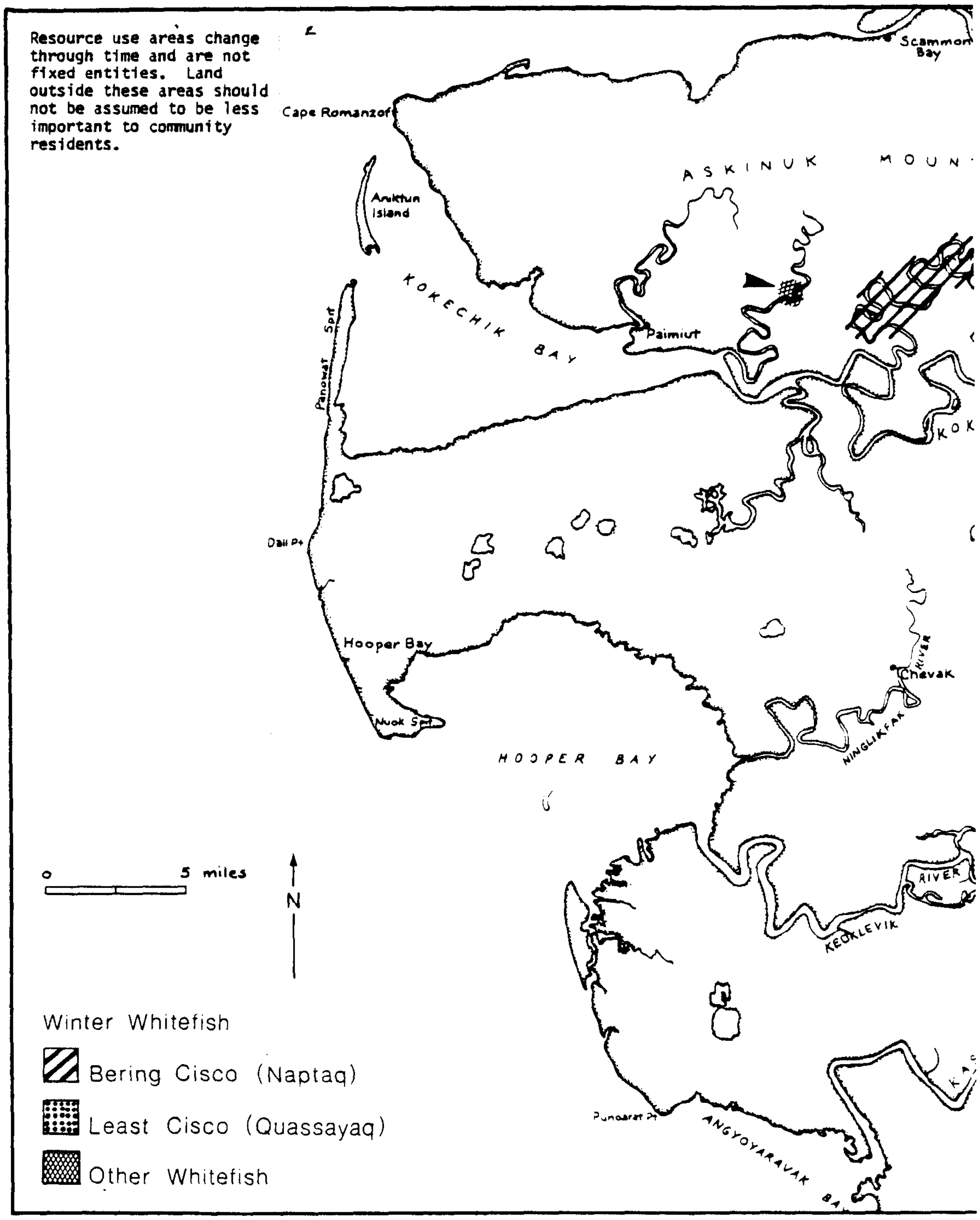
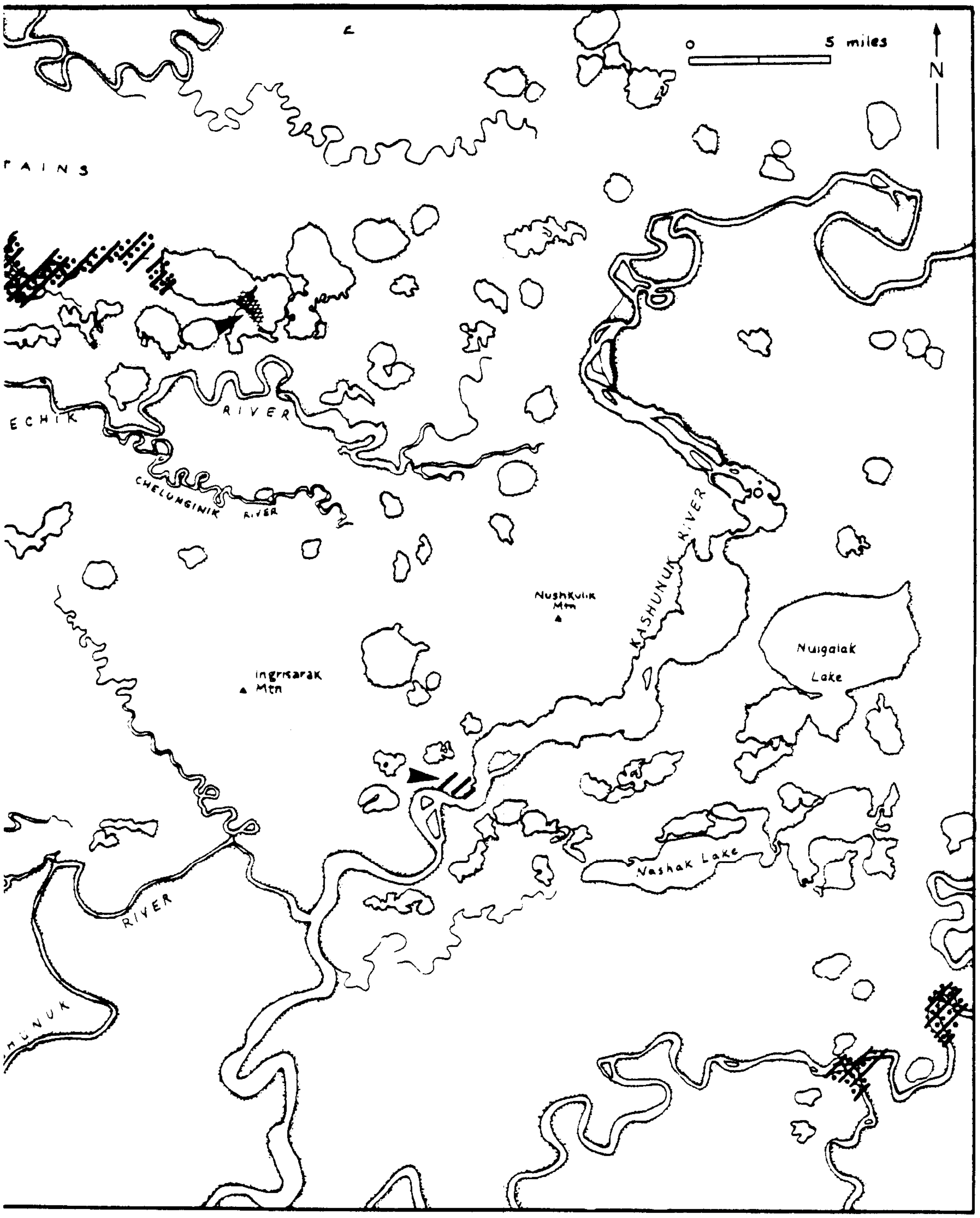


Fig. 28. Winter whitefish areas of Hooper Bay residents, c. 1981-1983.



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5 miles
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TAINS
ECHIK
RIVER
CHELUNGINIK RIVER
KASHUNUK RIVER
Nushkulik Mtn
Ingrisarak Mtn
Nuigalak Lake
Nashak Lake
RIVER
HUNUK

Kashunuk and Manokinak rivers. Nets can be set as soon as the ice is safe after freeze-up. Some people keep their nets in all winter, but it was noted that in many locations the harvest of whitefish declines by January. Many people pull their nets out at this time. The spawning cycle for Bering cisco begins sometime in late winter and early spring. Some people noted that in March it was again possible to harvest whitefish and at this time some households chose to reset their nets under the ice, often in the Ingaklluk area. The nets may remain until the ice and snow conditions start become unstable, signalling the arrival of break-up. The nets must then be removed or they will be lost when the ice moves out.

Environmental Constraints

The four whitefish species that are harvested during the winter (Bering cisco, least cisco, sheefish, and humpback whitefish) are not evenly distributed throughout the area fished by Hooper Bay residents. Around Hooper Bay, the least cisco appears to remain year round in fresh water, although a few may be caught in the bay. The Bering cisco is anadromous and during the spawning run upstream and the post-spawning migration down-stream, the two cisco species occur together in some locations. Sheefish and humpback whitefish appear in small numbers at certain locations where cisco species are caught, but not in other locations. Therefore nets set in certain areas, such as in the lower Kashunuk River system, tend to catch only Bering cisco, while nets placed in other areas, such as the Ingaklluk area, catch all four species. Each location varies as to what species besides the Bering cisco are available.

Nets set beneath the ice are subject to getting frozen in. Nets are

set soon after freeze-up when the ice is relatively thin. As cold weather continues, the surface ice grows from the top down, usually to the depth of several feet. The top of the net or float line must be continually moved downward in order to prevent it from freezing into the ice. Very shallow streams or portions of streams may freeze solid, and are not good locations to place nets. Portions of streams with salt intrusion commonly have a layer of heavy salt water ice that increases in thickness upward as the surface ice is freezing downward. These areas also are usually poor sites for placing a net depending on the depth of the stream. The Ingaklluk area shown in Fig. 28 is an optimum location because it has several fresh water streams protected from the wind by two outcroppings of the Askinuk Mountains and inland so as to be free of salt water intrusions.

Other observations that local people made concerning winter whitefish availability were that when water levels are high, the current brings fish upstream, and if the wind is blowing from the north, the fish tend to migrate towards the south.

Logistics and Techniques

Winter whitefish are caught with the same net or nets used at berry camp and for fishing in the bay. These nets usually have three inch mesh and average about 60 feet in length. Households frequently set more than one net at the same or different locations. Accessories to winter net fishing include poles for each end of the net, ice chisels, shovels, ice ladles, and a long pole with a nail or hook on the end to help set the net initially. Snowmachines with sleds are used for transportation for winter fishing.

Most commonly, winter whitefish nets are set and tended by men from the same households, such as fathers, sons and brothers. It is not uncommon for male relatives in separate households to travel together to whitefish net locations, although each will have his own net(s).

Whitefish nets are set soon after freeze-up when the ice is safe for traveling. When a site is chosen, holes in the river ice are made in a straight line perpendicular to the riverbank. For a 60 foot net at least four holes are cut in the ice. One end of the net is pushed into one end hole and under the ice. Because the top or float line has a few floats attached along the entire length, the net stays at the surface of the water and does not sink. Another person goes to the next hole in the line, inserts the pole with a hook on it under the ice and snags the net's float line. Once snagged the net is pulled to the second hole, released from the pole and the procedure is repeated for all subsequent holes until the net is at the last hole. The floatline is then attached to two long poles brought for this purpose. The float line is tied at least eight inches below the surface of the ice, to prevent the net from freezing into the ice. A cross piece may be nailed onto the poles to prevent them from slipping down into the holes. Some smaller poles are placed in snow berms which are made behind the net poles and allowed to freeze in. The net poles are tied to these supports for added stability. When the net is secured, snow is shovelled into the end holes. The presence of snow in the hole helps prevent the ice from freezing as solidly. The intervening holes are allowed to freeze over and will not be used again, unless the net needs to be reset.

Whitefish nets are checked as often as every two or three days or as long as once a week, depending on the weather. Men travel to whitefish

sites such as Ingaklluk only if the weather is good, since it is at least a three-hour round trip. Men depart from the village when it is light in the morning. After arrival on the site, the two end holes are reopened and one end of the net pulled up onto the ice. A long line brought from the village is tied to one end of the float line. One person holds onto the line while the other person pulls the entire net up through the other end hole, picking the fish out of the net as they are encountered. These fish are deposited on the snow nearby and allowed to freeze. After the entire net has been picked, the line is used to pull the net back under the ice to the other end, whereupon it will be retied to the pole. The net poles are resecured and the holes filled in with snow. The fish are put into burlap or large plastic bags for the return home.

Disposition of Harvest

Winter whitefish are eaten frozen and raw with seal oil as part of a meal and as snacks. The frozen fish are considered delicious, especially the qassayaq (least cisco). The fish are cut into thin slices lengthwise and then cut into smaller strips, dipped into seal oil, and eaten. Some people likened this to eating "candy" and small children are given little pieces dipped into seal oil as a treat. Most whitefish harvested at this time are retained by individual households, although some limited sharing occurs.

Needlefish

Location and Timing of Harvest

Many of the freshwater streams around Hooper Bay host needlefish, and some locations are known for large concentrations. Major areas cited

were the marshy areas around Kokechik Bay and Kokechik River, along the Kashunuk and Aprewn rivers, and east of the village of Chevak (Fig. 29). Napayaraq Slough has needlefish in the fall, but not in the winter. Other areas that also have been used are near Paimiut and the village of Scammon Bay, such as the Kun and Ear rivers. These tributaries were used when locations closer to the Hooper Bay area were not yielding enough fish.

It should be noted that extensive needlefish harvests occurred in the past, up until the widespread adoption of snowmachines. Needlefish were an important source of food for human and canine consumption. Before stores and canned goods, needlefish provided one of the few winter buffers against resource failure and possible starvation. People were willing to make extensive journeys, even to the Scammon Bay region, often on foot, to harvest these diminutive fish. In the early part of this century, many families moved to the Kokechik Bay area during the winter to facilitate access to needlefish. Men at mink camps after freeze-up would fish for needlefish along with the other species of fish. When stores provided more secure winter food supplies and snowmachines replaced local dogteams, the harvest of needlefish decreased enormously. However, there is still a limited harvest that takes place every year.

The major harvest of needlefish in the past took place in winter. This is still most likely the case, however some harvest takes place at other times of the year as well. Some households harvest needlefish while at berry camp for immediate consumption and diet diversity. During fall fishing for whitefish, tomcod, sculpin and flounder in the bay, some people travel rivers a short distance to harvest needlefish for immediate

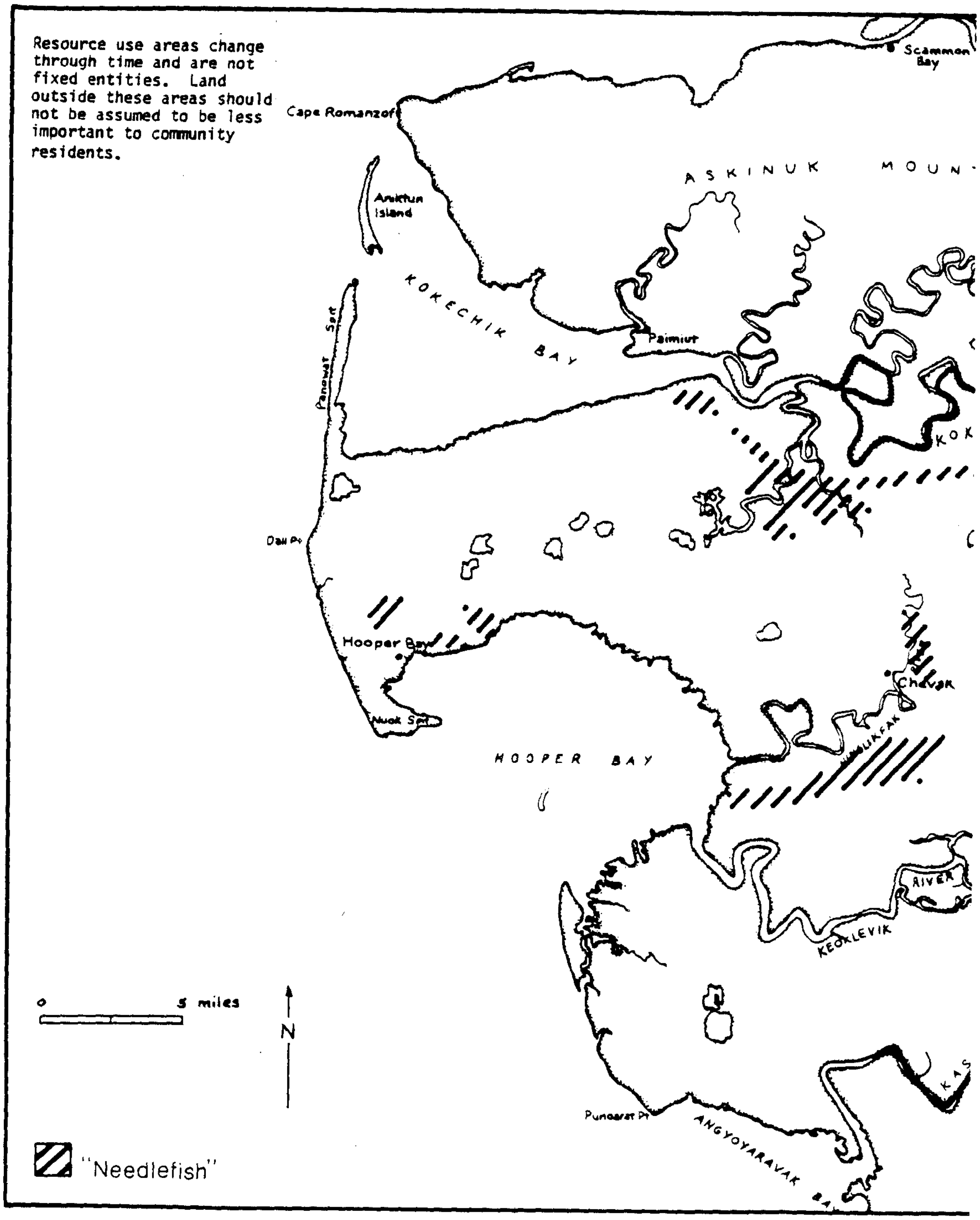
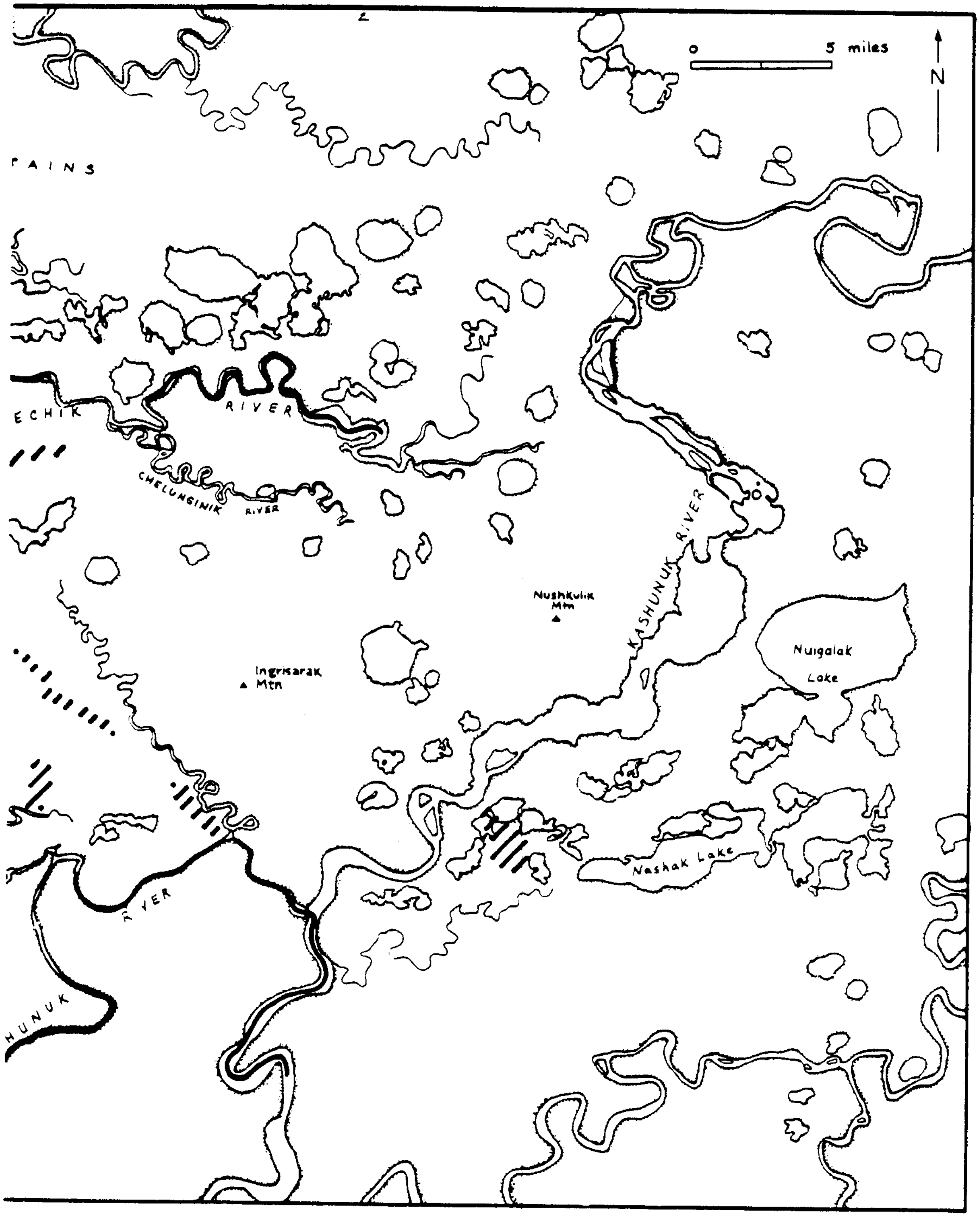


Fig. 29. Needlefish areas of Hooper Bay residents, c. 1981-1983.



0 5 miles
N
ECHIK
RIVER
CHELUNGINIK RIVER
KASHUNUK RIVER
Nushkulik Mtn
Ingrisarak Mtn
Nuigalak Lake
Nashak Lake
RIVER
HUNUK

consumption. The month of October before freeze-up is best for this type of harvest. Most winter harvests of needlefish presently take place around the common use areas such as the Kokechik Bay area and the Kashunuk and nearby rivers.

Environmental Constraints

In the fall, needlefish migrate downstream to deeper water both within the river system and just offshore. Since they travel in schools, specific locations on a stream system may have abundant fish while locations up or downstream might have very few. One site might be successful right after freeze-up, but as winter progresses it is probably necessary to shift the harvest location downstream following the needlefish migrations. People usually have more than one location where they may look for needlefish. Searching the closer locations first, they move to alternate locations if they are having limited success.

Other factors influencing needlefish harvest include the same weather concerns that affect most other fall and winter pursuits. In general, days of inclement weather including extreme cold temperatures, brisk winds, and blowing snow conditions eliminate most, if not all, resource harvest activities.

Logistics and Techniques

There are several ways to harvest needlefish. Probably the simplest method and the one often used by families at berry camp is to wrap bundles of grass around the end of a long stick and place the grass end into the margins of a stream. It is left in for a few hours and then checked. Usually enough needlefish will have been caught among the grasses to make

a meal.

The gear commonly used to harvest needlefish in the fall and after freezeup is the dipnet. This is a fairly sizeable dipnet with a net length of around six feet often made up of two different mesh types. The upper portion of the net attached to a Y- shaped frame is about two feet in total length, although this varies. The mesh size of this portion of the net is one-half inch on a side. The lower portion of the net is three feet or longer in length with a mesh size of less than one-quarter inch on a side. Potato sacks are sometimes used for this lower net. The Y-shaped frame is about four feet wide at its widest opening, attached to a handle as long as eight feet.

Another type of gear used to harvest these fish is a "needlefish" trap. Using a taluyaq design, it is constructed out of hardware cloth with small wire mesh. A short pole is attached perpendicular to the opening with which the trap is pulled out of the ice when checked. In effect, the trap acts as a rigid style dipnet set as fixed facility.

Before freeze-up, the household skiff is used for transportation and after freeze-up a snowmachine with sled is used. In the past dogteams were used by those families who had them. Poorer families walked to fishing sites, pushing or pulling a sled carrying gear and camping supplies for a stay of up to a week or longer. With snowmachines, day trips may be made to all but the most distant locations.

As with most fishing endeavors, men are the major participants in needlefish fishing. Chopping large ice holes for the dipnet or the trap is hard work. Large dipnets are heavy and unwieldy once the net is in the water and they can be extremely difficult to pull out of the hole.

When the dipnet is used before freeze-up, it is usually deployed in

small streams. One technique is to put the net in the water near the bank, walk upstream of the net, and create some kind of disturbance in the water, scaring the sticklebacks downstream into the net.

After freeze-up, a large hole greater than four feet in length and probably over two feet in width is made in the river ice perpendicular to the bank. The dipnet is inserted and held upright against the current. After some time the dipnet is pulled out and the contents poured from the net into a bag or container.

Disposition of Harvest

The few households in Hooper Bay that actively harvest needlefish during the fall or winter typically share with relatives. In this fashion, more households are able to have needlefish in their diet than is reflected by the actual number of active fishermen. Usually a household will be given a few quarts of fish, enough for consumption over a period of a few days.

Needlefish are eaten raw with seal oil, often after they have been allowed to set in water for a few days to a week to "ripen" or ferment. They also are added to soups. Needlefish may be a major component of a meal, a side dish, or a snack. According to stories told by elders, this very diminutive fish is high in energy when eaten, a lesson that despite their small size, needlefish are valuable food. Today, needlefish chiefly add diet diversity, not bulk, to the family food supply. However, they are still enjoyed by many people and remain a resource that could be further exploited again, if circumstances warranted it.

Burbot

Location and Timing of Harvest

During late summer to mid-winter, a few burbot are taken by some households while at berry camps or at mink trapping camps. Others set nets during the fall or right after freeze-up to take advantage of a small, limited migration. These occasional harvests take place mainly within the Kashunuk River drainage, Ukalikchik River, and occasionally the Kokechik River (Fig. 25). The largest harvest takes place in late February and March during the time of the spawning run in the Lithkealik River (Fig. 25). It was noted that after spawning was over, the burbot dispersed rapidly.

Environmental Constraints

For much of the year, burbot are present in stream systems in such small numbers that they are relatively inaccessible to Hooper Bay residents until late winter. At this time the fish are heading upriver to spawn in high densities. The Lithkealik River was cited as the only location in the vicinity of Hooper Bay where substantial spawning runs occur. Other locations such as the Ingaklluk whitefish area, and the Kiluuk and Ukalikchik rivers are sites where set nets yield low numbers of burbot. One person noted that burbot are only caught in areas where there is no salt-water intrusion.

Logistics and Techniques

Some fishermen set nets at Paimiut or different locations specifically for burbot or for other fish such as whitefish. Set nets are of

variable length with 4 1/2 to 5 1/2 inch mesh. The most efficient gear for harvesting burbot during the spawning run is a trap about 9 feet in length and 36 inches in diameter at the mouth, placed in a river with a fence at either side. Because of the time of year and size of the trap with its fence, it takes from three to five days to cut all the ice necessary to set the trap.

Only a few households from Hooper Bay maintain burbot traps working with men from the same or related households. A trap may be put in as early as December although the spawning run does not take place until the end of February. A shallow upstream location is chosen. Small holes set close together are made for the poles which make up the fences. The fence closes off the stream from the bank to mid-channel. The trap is installed in the channel between the fences, with the mouth facing downstream.

Disposition of Harvest

Burbot caught incidentally in set nets are usually retained by the individual household owning the set net. However, during the spawning run near Paimiut, large numbers of fish may be harvested by traps and set nets. These catches are shared with relatives and other members of the community or sold to community residents for a very nominal cost. One person who had a trap in February 1983 stated that during the spawning run of a good year, a trap can harvest about 100 of these fish.

Northern Pike

Location and Timing of Harvest

There is a small harvest of pike during August, mainly by people who

have berry camps at the eastern end of the Askinuk Mountains or far up the Kashunuk River drainage (Fig. 21). Some pike also are caught with set nets set under the ice at distant mink trapping camps and occasionally at the Ingaklluk whitefish area. This harvest is usually incidental and limited in numbers.

The major harvest of pike takes place in March and early April when the daylight hours are growing and the temperatures are becoming warmer. These environmental factors facilitate the harvest at known spawning grounds for pike near Kusilvak Mountain, 65 miles northeast of Hooper Bay and the Ingatslugwat Hills over 70 miles southeast of the village. These sites are not shown in Fig. 21. The Kusilvak area is used in common by residents of Hooper Bay, Chevak, Scammon Bay, Mountain Village and lower Yukon River delta communities. The Ingatslugwat Hills area is also used by residents of Hooper Bay and Chevak, although Kusilvak is now the more commonly used location.

Snowmachines, which permit fast travel, coupled with enough daylight and moderate temperatures, facilitate participation in pike fishing at these distant but lucrative locations.

Environmental Constraints

As noted previously, the distribution of pike is fairly uneven within the area of Hooper Bay resource use. They are present in some streams and not in others. Even where they are present, their harvest is usually low; enough so that they have not figured prominently in Hooper Bay diets. In late winter, pike move upstream to the marshy areas at the base of Kusilvak Mountain and the Ingatslugwat Hills. Here in the shallow water they can be efficiently harvested by nets set under the ice and by

hooking.

Logistics and Techniques

Pike are harvested with the general-purpose set nets of 3 inch mesh used to harvest whitefish, sculpin, flounder and tomcod. Hooking gear is the same as described for tomcod. Accessory gear include snowmachines, camping equipment, food supplies, ice chisels, and burlap bags. Late winter pike fishing at Kusilvak Mountain is undertaken by men and women in their late teens to late middle age. Older heads of households may go once every few years. The activity is especially popular with young adults who welcome the opportunity to camp at a time when the days are getting brighter, daylight is longer, and the temperatures more moderate than in mid-winter.

While some households set a net under the ice, hooking is the most commonly used method. Using hooks baited with blackfish or some other kind of fish, the hook is jigged through a hole in the ice and pulled up quickly when a pike hits the bait. Because of the concentration of pike during spawning time, it is possible to harvest a large number of fish in a short period of time. Nets may catch more fish but take longer to operate. It is possible for people to harvest one or more burlap bags of pike before returning home.

Disposition of Harvest

Pike that are harvested in large quantities in late winter are split by the women in the household and hung on outdoor racks to air dry. After they are dried, they are eaten with seal oil. Some pike is eaten fresh.

Seal Hunting

After freeze-up, the shorefast ice continues to form and extend outward from land and the pack ice continues to advance southward. At this time little or no seal hunting occurs. By December the shorefast ice usually has stabilized. The pack ice is subject to constantly shifting flaw zones where it touches the shore-fast ice. Ringed, spotted, and bearded seal are present around the vicinity of Hooper Bay during mid-winter. The ringed seal is most prevalent, while bearded seals are occasionally seen. Depending on the conditions, some men hunt seals during the winter. The winter of 1982-1983 had unusually good conditions for winter seal hunting. There was very little shorefast ice present, small amounts of floating ice, and the leading edge of the pack ice was farther to the north. Because of the excellent conditions, winter seal hunting was relatively intensive that year.

Location and Timing of Harvest

Winter seal hunting usually takes place in a more restricted area than seal hunting the rest of the year. Most of the hunting takes place near Nuok Spit, although some activity occurs between Nuok Spit and Cape Romanzof (Fig. 12). Depending on the extent of shorefast ice, the distance to open water will rarely be more than five miles from the village.

Winter seal hunting occurs from December until break-up. During most winters, seal hunting is an activity that is pursued only by a few hunters. During winters of light ice conditions, more hunters participate. Generally, hunting activity is light during the mid-winter months, gradually

increasing in February. The increase of activity is influenced by a shift in gear type, from the qayaq and canoes that are used almost exclusively in December and January to the aluminum skiffs that are used through break-up.

Environmental Constraints

Winter seal hunting usually does not start until the shorefast ice is stable and safe to travel on, which usually occurs by December. Areas of open water alongside the shorefast ice are needed for effective hunting. If there is too much floating ice, it is possible for hunters to get locked out from land. If they hunt in these conditions, they do not go out too far to avoid being locked out. They also use the Askinuk Mountains to predict the changes in weather as noted earlier.

The geographic features of Cape Romanzof and Panowat and Nuok Spits act to create relatively unstable pack ice conditions. The jutting features of this stretch of coastline, especially the rocky promontory of Cape Romanzof cause the pack ice to fracture close to the shorefast ice creating flaw zones (areas of open water). It is these areas of open water where seals may occur in higher densities than found in areas of stable pack ice. The presence of these flaw zones near the village is advantageous for finding seals during the winter.

Logistics and Techniques

The major type of gear used for winter seal hunting is the <u>qayaq</u>. A few hunters use aluminum canoes. The <u>qayaq</u> is the boat that was traditionally used for all marine mammal hunting at Hooper Bay but was gradually supplanted by the introduction of wooden plank boats and later by

aluminum skiffs with outboard motors. The introduced boats replaced the qayaq in spring and fall seal hunting. However, a few households still retain qayaq for mid-winter seal hunting at Hooper Bay. At least two hunters noted that they use skiffs during the winter, but require larger areas of open water than do hunters which use the qayaq. Hunters who use qayaq hunt during December and January, while those using aluminum skiffs hunt seal in February and March.

The major reason cited for the continued use of qayaq during winter seal hunting was the unreliability of outboard motors operated in extreme cold water temperatures. Reportedly outboards are prone to failure and are not considered safe in conditions where the wind shifts rapidly, changing the flow and density of the floating ice in a given area. Another reason cited was that qayaq were safer under conditions of unstable shifting floating ice. Aluminum skiffs have been known to pop rivets if caught between large ice floes. Qayaq are much lighter and easier to maneuver or pull up onto a floe. The basic design of the qayaq also helps it to withstand a high amount of stress. Other gear for winter seal hunting is similar to that described for spring seal hunting described in Chapter 4.

Usually the most experienced active hunter in a household pursues winter seal hunting especially when qayaq are used. Men hunting with qayaq will hunt either by themselves or with other men with qayaq.

The general method for winter seal hunting is to scout by snowmachine the area from Nuok Spit north along the beach in search of open water. When open water is located, the hunter returns to the community, loads the qayaq and associated gear onto a sled and takes the qayaq to the edge of the shorefast ice at the site of open water. The hunter then waits at

the edge of the ice for seals to venture by. This wait sometimes may last up to several hours. If a seal is spotted within range the hunter shoots at it. If successful the hunter quickly launches the qayaq and paddles out to the kill site where the seal is retrieved. A harpoon is used to secure the seal if it is only wounded, but it will be dispatched with another shot. If the weather is particularly good and there is adequate open water, some hunters paddle some distance in the water looking for seals instead of waiting on the ice. If a seal is spotted, the hunter will shoot at it from the qayaq. This hunting method is less common than shooting from shore.

Disposition of Harvest

The processing of seals once returned to the community is handled by the women of the household. Seals are processed similarly to those taken at other times of the year. Since it is predominantly ringed seals with some spotted seals that are taken at this time, sharing usually takes place among closely related households.

Small Game Hunting

Ptarmigan

Location and Timing of Harvest

The major harvest of ptarmigan occurs during the late winter months from February through April. Smaller harvests take place at other times during fall and winter. During the late winter and early spring months, ptarmigan that have migrated inland are returning to the coast, often in sizeable flocks. The flocks tend to be most numerous in the plateau area

that extends between Hooper Bay and Chevak and to the north, the lake area southeast of Ingrisarak Mountain, and around the willow and brush areas on the southern flank of the Askinuk Mountains (Fig. 13). A population of rock ptarmigan generally stays near the Askinuks all winter and are subject to limited harvests throughout the winter.

Environmental Constraints

Ptarmigan are year-round residents of the Yukon-Kuskokwim Delta. However, their migratory patterns make them largely inaccessible to coastal residents throughout much of the winter. Soon after freeze-up, ptarmigan migrate far inland to more forested regions and more accessible food supplies. By late winter, they begin to flock up and start their migration back towards the coast. During winters of persistent snow cover, ptarmigan may not arrive back on the coast until break-up or later.

Ptarmigans' flocking behavior results in high densities in a given location and low in another. A broad search pattern is employed to increase the chances of intercepting these flocks.

Logistics and Techniques

Most people hunt ptarmigan using snowmachines as transportation and small caliber rifles such as .22, shotguns or both. The gear requirements for hunting ptarmigan are relatively simple in comparison with other activities.

Young men are usually the most active hunters of ptarmigan. Physically active older men also participate to a more limited extent. Parties of one or two men are most common.

Disposition of Harvest

Some households only harvest enough ptarmigan at any one time for immediate consumption. These ptarmigan are skinned and gutted and boiled for soup. If a household harvests more ptarmigan than it can use during several days, the ptarmigan are processed for later use. Households with freezers may freeze some of the birds, but the most common way to preserve them is by drying. They are skinned, gutted, and hung on an outdoor rack to air dry. The dried birds are usually eaten during the spring and summer.

Ptarmigan do not contribute substantially to the household diet. However, during late winter when the supply of dried and frozen foods are dwindling, ptarmigan provide fresh meat and diversity to the diet. Whether they are eaten for one meal or for several, their arrival back on the coast is welcomed by the residents of Hooper Bay.

Hares

Location and Timing of Harvest

Hares are locally present throughout the year in the area surrounding Hooper Bay. They are most commonly harvested in the late winter in the willow brush areas of the Askinuk Mountains (Fig. 14). Whereas in summer there is food available for hare all over the tundra, in the winter most major food items are buried under snow. Exposed willows, such as those around the Askinuk Mountains become an important food source for hares in the winter. Because these willow areas are restricted in spatial location, the local populations of hares tend to be concentrated here in higher densities than normally occur in the summer or fall. Hares are

normally hunted in the late winter months.

Environmental Constraints

The major factor influencing the harvest of hare around Hooper Bay is the cycling of the hare population. Not much is known about tundra hares, but the snowshoe hares populations run in cycles that range from seven to fifteen years apart (Reardon 1981). When hare populations are low, they may be extremely hard to hunt. When the populations are high, local people noted that they are seen nearly everywhere. Apart from the population cycles, the same general weather conditions that influence other winter hunting and fishing activities, also affect the hunting of hares.

Logistics and Techniques

Hunters use a snowmachine for transportation and a small caliber rifle such as a .22 to hunt hares. Usually the younger men of a household are the ones who hunt hares. Elder heads of households usually hunt hares when they are encountered while pursuing some other activity. Young men may go out singly or with another male to hunt. Usually, men search the general area around the willow groves by snowmachine. If a hare or its fresh tracks are spotted, men attempt to pursue the animal. Hares are dispatched with rifles.

Disposition of Harvest

Hares are skinned and the meat of the cleaned carcass are boiled as part of a soup. The skins are tanned by the women and usually made into fur parkas (<u>atkuk</u>) with the fur facing inside and a cloth cover. Often

these parkas are made for adults as the hare skins are considered fragile and not often suitable for young active children. Overall hare contribute little bulk to the diet, but they do provide diversity and a source of fresh meat during the late winter months when other food supplies are dwindling.

Wood Gathering

During winter, many households intensify their search for driftwood. In the early winter, right after freeze-up, they first retrieve the wood they accumulated in the fall along the beach. As the course of winter progresses, this wood supply is expended and the households using wood for heat must search an ever increasingly large area. Wood gathering is one of the most common activities of the winter.

In the past, driftwood was a source of heat, especially for the large community men's house (qasgiq). With the introduction of frame houses, oil stoves began to supplant driftwood as the chief source of heat and cooking energy. In the past decade, the rise in cost of all petroleum products, especially those delivered to rural areas of Alaska has encouraged most Hooper Bay households to install wood stoves in their houses. Some families now totally depend on driftwood as their heat source; most households tend to use a combination of fuel sources. Some families rely on wood as much as possible, but use stove oil in late winter when it becomes increasingly difficult to locate wood. Other families predominantly use stove oil, using wood when it is available to offset high fuel costs.

Location and Timing of Harvest

During the winter, people search for wood in areas where wood was collected from in summer and fall. The area searched expands gradually until it includes all the coast between Cape Romanzof and the mouth of the Kashunuk River, with some households going as far as Hazen Bay by late winter (Fig. 24). If little wood is available in winter people travel to the Askinuk Mountains and cut willows from the scattered groves flanking the south side of the mountains. This source of wood is not as good as the driftwood because the willows are smaller and green.

Winter wood gathering occurs on an as-needed basis throughout the winter, from freeze-up until the ice becomes unstable at break-up. Some households pursue wood gathering only while wood is available near the community, others gather wood the entire winter, making extensive trips afield in search of wood.

Environmental Constraints

The availability of driftwood varies each year, as noted in previous sections on driftwood availability in this area. In winter there is the further consideration of snow covering beached wood, making it difficult to retrieve. Thaw conditions that make it difficult to travel with heavy loads impede wood gathering. Other conditions such as blowing snow and blizzards make long distance traveling hazardous and prevents wood gathering.

Logistics and Techniques

A snowmachine and sled are the major gear requirements for re-

trieving already stacked wood and gathering new logs. Shovels, ice chisels, axes, and saws are used to dig out snow drifted logs and cut them to manageable sizes for transport back to the community.

The men of a household gather wood. This is usually done by the head of the household unless he is not physically capable, in which case an older son or sons assume the task. Wood gathering is done by one man or by a man and his son. Individual households usually take care of their own needs, however, a father or brother might supply the needs of a family member living in a separate household if they are unable to procure their own wood.

Wood gathering takes part or most of a day depending on the distance traveled. Most men usually leave soon after it is light to gather wood and return by dark, even if they have had to go long distances. They haul as much wood as they can get on the sled. Wood is piled outside the house, sometimes in upright stacks to prevent it from getting buried by snow. Enough wood is cut to last a few days, with the supply being renewed as needed.

Disposition of Harvest

Besides providing a heat source, wood collected in winter is used in the production of household utensils, sleds, sled parts, and qayaq frames. Its major use in winter is as a source of heat for the house.

DISCUSSION

Winter along the coast of the Yukon-Kuskokwim Delta is the most difficult season in which to procure food. Many resources present during the ice free months are unavailable during the winter due to migration

patterns or inaccessibilty given the ice and snow conditions. Harvesting other resources present around Hooper Bay and Kwigillingok during the winter commonly is restricted by severe climatic and traveling conditions.

Trapping furbearers is major activity for residents of Kwigillingok and Hooper Bay during the winter. Both communities harvest similar furbearers, but there are some differences. Mink tend to be more numerous around Hooper Bay area. More men trap mink from that community with many still going out to winter camp for one to three months. Mink trappers from Kwigillingok operate out of the community.

There are variations in fox populations between the two areas. Kwig-illingok is at the southern limit of the arctic fox range, so trappers tend to harvest more red fox around this community. Around Hooper Bay, arctic fox are more numerous than are red fox, as is evident from the local harvest.

Both communities harvest furbearers for several purposes. Mink is the financially most lucrative furbearer. Trappers sell most of their pelts, but some will be retained for household use. This is also the case with red fox. Arctic fox pelts are largely sold, but otter pelts are usually retained for home use. In addition to pelts, the carcasses of mink and otter are also eaten.

Kwigillingok and Hooper Bay show certain differences in the scope of their fishing activities and available fishery resources during winter. For Kwigillingok residents, harvesting tomcods from freeze-up until December represents the only major source of frozen fish for the community, although some people have blackfish traps which remain productive for the entire winter. Generally, by January most subsistence fishing activities have drawn to a close and Kwigillingok residents put their energy into

the various church rallies and songfests that are hosted by themselves and surrounding villages during January through March.

In Hooper Bay, however, fishing continues throughout the winter although there may be short lull periods. Besides the harvest of tomcods after freezeup, whitefish nets are set for cisco, sheefish, humpback whitefish, and occasionally pike. Many families have blackfish traps that remain productive throughout the winter and some families still harvest needlefish. By late winter, fences and traps are set to harvest the spawning run of burbot in the Askinuk Mountains, a hook fishery on the shorefast ice harvests another run of tomcods, and short camping trips are made to the Kusilvak Mountain to harvest the spawning run of pike.

The characteristics of the river systems may account for the differences in the winter fisheries of Hooper Bay and Kwigillingok. The deeper depths of many of the river systems near Hooper Bay probably allow for the year-round residency of many fish species. In contrast, the myriad rivers and sloughs near Kwigillingok that drain the coastal plain are all relatively short and shallow. The extent of freezing in these shallow water systems may be a major factor in the limited nature of available winter fish resources.

Marine mammal hunting patterns also differ between the two villages. Kwigillingok residents do not seal hunt during most of the winter, although scouting for seals may occur by late February. Elders noted that even in the past, the ice conditions during this time were considered too unstable and risky to hunt even with qayaq. By contrast some Hooper Bay men hunt for seals during the winter, usually from January on. Because the ice is still considered unstable and outboard motors unreliable in cold temper-

atures, the men who hunt during mid-winter usually retain _qayaq_ or canoes for this purpose. By late February, some men start employing aluminum skiffs and outboards to hunt, though the winter fishing effort is small in comparison to the spring activity.

By late winter, the number of available daylight hours starts to increase and temperatures gradually rise. Ptarmigan start moving back in large flocks to the coast. These birds, together with hares harvested at this time, provide fresh meat and diversity to a diet that has been largely based on dried and frozen foods whose supplies are dwindling.

The activities of winter occur under conditions of limited light, cold temperatures, and often extreme chill factors. Days of blowing snow and blizzards occur frequently as well as unseasonable thaws which effectively postpone subsistence activities until better weather conditions are present. Severe conditions may last from mid-October until mid-May, and result in resource failure. Thus, although it is usually possible for both villages to procure some food during the winter, people prefer to be well-prepared if possible before freeze-up to forestall running out of stored foods should the winter prove harsh or too long.

CHAPTER EIGHT

RESOURCE USE ISSUES

Chapters 4 through 7 documented that the subsistence harvests of local fish, wildlife, and plant resources are central components of the economic and social systems of Kwigillingok and Hooper Bay. Disruptions in hunting, fishing and gathering activities would entail substantial hardships for the residents of these communities. Consequently, the local people are interested in preserving their fishing and hunting capabilities for today and the future.

This chapter discusses four areas of concern expressed by residents during the course of this study involving their continued ability to harvest fish and wildlife for subsistence uses. These concerns pertained to offshore oil and gas development, changes in or repeal of the State subsistence law (SLA 151), commercialization of fish resources, and sport use of local resources. The former two issues were of widespread concern in both communities. Of the issues related to fish and game resources expressed during the study period, these two were thought to have a great capacity for changing or disrupting the resource harvesting activities that are the base of these communities' economic system. The latter two concerns were not as widespread but were expressed by a few residents during the study.

OFFSHORE OIL AND GAS DEVELOPMENT

Oil and gas development are generally viewed as a threat to the local economic base by community residents. Residents expressed concern about the lease sales planned for the Bering Sea in Norton Basin, Navarin

Basin, St. George Basin, and the North Aleutian Shelf. As are discussed below, many of their concerns relate to the harsh environmental conditions of the Bering Sea of which residents have had a long history of observation and experience. Other concerns revolve around the suspected effect of possible oil spills and resultant pollution on wildlife species living around or migrating through the area of the spill. Some village residents noted that they do not think the potential benefits of oil development (possible jobs, more cash flow into the economy) outweigh the potential costs to their communities and present economic base. A larger issue of proposed oil development is the legal standing of hunters and fishermen who have been using the same areas and resources for generations vis-a-vis the oil companies, newly arrived in the area.

In general, many community residents, especially elders, doubt that the oil companies have the technology to handle the environmental conditions of the Bering Sea. Although summer storms are a concern, the major concerns revolve around winter ice and storm conditions. According to local report, the ice that covers the Bering Sea in this area during the winter is usually several feet thick and is responsive to wind action, fracturing, and other natural forces. Despite the large size of many ice floes and pans, they are capable of moving very swiftly under certain conditions and residents consider their force to be awesome. In the oral histories of each community are several accounts of winter storm surges that pushed the sea ice several miles inland, often with such speed that there was no warning. This has resulted in settlements being razed and the land substantially modified. Nelson (1882) noted encountering sea ice several miles inland and elders noted inland fresh water areas that were permanently altered during such storms because of the introduction

of salt water and ice.

Storm surges and ice movement are seen as threat in at least two ways. First, residents perceive the power of the moving ice as being greater than the holding strength of man-made structures such as an oil rig. Second, the ability of storm surges to bring water and sea ice far inland means that the possibility exists for pollutants to be carried far beyond the boundaries of the sea.

By and large, the residents of the study communities are keen observers of the environment. They perceive cause and effect relationships between wildlife populations and environmental changes. Concerns about the impact of pollutants on marine species and other wildlife are related to observations of local examples of environmental disruptions. According to local observers, changes in salinity of fresh water bodies has resulted in the local extirpation of fish species requiring fresh water. The scouring of tidal areas by ice has caused the local depletion of cockles. Habitat modification by reindeer caused a diminishment in salmonberries. Habitat damage by all-terrain vehicles may be disrupting to nesting birds. A combination of factors, including noise from outboard motors and shifting ice patterns, may be influencing belukha migrations. These are just some of the changes and resultant resource disruptions that residents of these coastal communities have observed. Residents are acutely aware of the relative fragility of their local environment and the complex interaction among many wildlife resources. This causes them to be concerned about oil as yet another factor that could possibly lead to major disruption of these resources through degradation of the environment or actual impact on resources themselves.

For most residents, the possible benefits of oil development are not

seen to be worth the risks to the community. Despite assertions by industry spokesmen that oil development will mean wage employment for rural Alaskans, certain residents believe that during the development of Prudhoe Bay, native Alaskans were a minor part of the work force because they lacked the necessary skills and training. They indicated that they felt that this would still be the case in the development of the Bering Sea lease areas. The range of awareness and knowledge of oil development varies among the people of these communities, but the prevailing view of many residents is that because oil and gas resources are limited, there are few long-term benefits from development. Some people have noted that the wildlife resources that make up the more reliable aspect of the economy may be altered so that this base is no longer dependable. The cash sector will continue to be weak, resulting in a precarious local economic situation. This presents a risk that many local residents state they do not want to take. Regionally, the issue of potential development was of such concern that the Association of Village Council Presidents, representing the villages of the Delta, sought to have all nonselected land within the Delta included within the Yukon-Kuskokwim National Wildlife Refuge for additional protection.

It should be noted that since 1982 the Hooper Bay village profit corporation (Sea Lion Corporation) has been involved with the Cook Inlet Regional Corporation to exchange corporation land with the U.S. Department of Interior for land on St. Matthew Island in the Bering Sea. If the land exchange goes through, the land on St. Matthew will be leased to oil companies to provide a staging area for exploration and possible development of the Navarin Basin. Hooper Bay residents are generally against the idea of potential oil development in the Bering Sea, so the

action of the corporation appears contradictory. Sea Lion corporate officials were aware that Cook Inlet Regional Corporation was likely to make a land swap with the Interior Department, and that coastal communities of the Yukon-Kuskokwim Delta (including Hooper Bay) would be the most impacted by potential spills if oil were developed. Therefore, Sea Lion Corporation decided to join with Cook Inlet Region in the land exchange in order to receive some financial compensation from the oil companies for the possible future impacts. This action was taken in part because St. Matthew Island is far from Hooper Bay. Corporate officials recognized that their shareholders are opposed to any oil company or other developmental activities occurring in the general vicinity of Hooper Bay and the community resource use areas (J. Joseph, pers. comm. 1983).

SUBSISTENCE LAW REPEAL, 1982

Another main concern expressed by residents during the course of this study was direct alteration of their subsistence based economic system through changes or repeal of the State's current subsistence law. During the study period, residents of Kwigillingok and Hooper Bay were aware of the controversy surrounding the legal standing of subsistence activities and a subsistence-based economic system with the most visible opposition focused on the State's subsistence law (SLA 151). Opponents first sought to change the law through the legislative process and then to repeal the law through a proposition put before voters in 1982. This proposition was rejected. The legal issues surrounding the definition of subsistence have been long standing and most of the debates have been conducted in forums far away from rural villages, including the two coastal communities of this study. However, as opposition and media attention focussed on

the "subsistence law," residents of these villages perceived the debate about the law as a direct threat to their livelihood. Residents cited the limited nature of wage opportunities within the villages and noted that hunting, fishing, and other wild resource harvesting activities were their "jobs." Restrictions on their ability to hunt and fish were likened to depriving them of their source of employment and were therefore seen as a threat.

In addition to direct changes to the subsistence law itself, other restrictions or changes in access to specific resources were also regarded with concern. Indigenous resource use have adapted over time to the local biological and environmental constraints which are the major factors regulating the timing of resource harvest. Currently, regulatory scheme established by the State are said to have relatively little meaning for village residents as they pursue their livelihood. Most recognize the State's ability to regulate commercial activities such as commercial herring and salmon fisheries. For other local resources that are not of commercial interest to the State however, village residents fall back on their own local harvesting system. Many residents are unaware that the State has established licensing requirements, seasons and bag limits for most resources. Residents for the most part have little contact with state biologists. The information network and booklets put out by the State appear to have little exposure in the small, rural communities, and occasionally the State's regulatory requirements appear unrealistic and inflexible in light of local harvesting conditions. Thus, people pursue most local resources following their own seasonal round which has evolved in conjunction with local biological and environmental conditions and which best meets their needs.

COMMERCIAL HERRING FISHERY

Adjunct to these concerns is the potential introduction of competition for resources that have primarily been harvested for subsistence purposes. Both communities have supported the development of local commercial fisheries as long as local residents are able to have active participation and as long as there is no conflict for harvesting resources considered essential for the communities' well-being. As an example, Hooper Bay residents supported the opening of the commercial herring roe fishery at Cape Romanzof because it could potentially be a source of cash earnings for community fishermen. This fishery was not thought to directly impact the small run of herring into Hooper Bay which supported the local subsistence fishery. The local fishermen did oppose the competition from non-local boats which traveled between the various commercial areas of the Bering Sea with their own processing boats. The local fishermen from Hooper Bay, Chevak, and Scammon Bay responded to this competition by successfully lobbying to make the Cape Romanzof fishery an exclusive registration area.

During the course of this study Kwigillingok residents generally opposed the concept of commercial herring fishery around their community and a few residents opposed an opening in the Nelson Island area. These residents oppose such a fishery as they feel that Nelson Island stocks are the source of their local herring and they do not want their local subsistence fishery disrupted. To date there have been no proposals to open a commercial herring fishery around Kwigillingok, but the strong herring run around Nelson Island has been the subject of proposals over the years. Nelson Island residents remain opposed to a commercial

fishery there for similar reasons.

COMMERCIAL SALMON FISHING

Within the community of Hooper Bay there has been some interest in commercializing the local salmon fishery. However, this has not been supported throughout the community because of concerns that a commercial fishery would compete with the subsistence harvest. Salmon is a primary food source when salmon are available, and as described above, the run is undependable in some years. Some interest in a commercial fishery still exists as evidenced by the request by the Lower Yukon Advisory Committee in their fall 1983 meeting that the legislature appropriate funds to the Alaska Department of Fish and Game to do a feasibility study in 1984 (Thompson 1983).

Kwigillingok residents are favorable towards the commercial salmon fishery in the Kuskokwim River because at present they are able to meet their subsistence requirements as well as derive a small cash income from the harvest of salmon. There is at this time no perceived conflicts between the subsistence and commercial salmon fishery.

SPORT USE

Members of both communities oppose the competition presented by the possible introduction of sport uses of resources in the area. A proposal to open a sport hunting season for whistling swan (Alaska Board of Game 1982) was generally opposed by residents of both communities who were aware of the issue. This was perceived as opening up sport hunting opportunities in an area that historically and currently has been predominantly oriented towards subsistence use. The State of Alaska's

attempt in 1983 to regain management of certain marine mammals was also not favored by those village residents who have heard of this effort. These residents fear that unrealistic quotas might be established by the State and that they might have to compete with sport hunters for resources that are their main economic base.

Community residents are aware that potential oil and other changes in their current resource situation that could alter resource populations, access to resources, and resource availability. These changes could disrupt their ability to harvest these resources. They believe that they will have to bear the burden of these impacts and changes.

CHAPTER 9

DISCUSSION

The preceding chapters provided a description of the complex annual rounds, natural settings, historical backgrounds, and contemporary community characteristics of Hooper Bay and Kwigillingok. The intent of this chapter is to compare and contrast the patterns of subsistence activities pursued by Hooper Bay and Kwigillingok and relate these patterns to the natural environment. Certain similarities and differences exist in the two communities subsistence patterns, many of which may be attributable to features of the communities' locations.

Hooper Bay and Kwigillingok have different historic backgrounds. Hooper Bay is currently the largest community in the Yukon-Kuskokwim Delta with a subsistence based economy, outside of Bethel. The earliest historical accounts (Nelson 1882) indicate that it has always been a large community and has attracted residents from the smaller dispersed settlements about it. It is an old, long-established community and shares a distinct dialect of central Yup'ik with Chevak which probably arose out of geographical isolation (Woodbury 1983).

On the other hand, Kwigillingok is a relatively small community. Historically the site where Kwigillingok is located was not the location of a winter settlement of long standing, but rather the winter camp site of an extended family group. Throughout the early part of the 20th century, the presence of missionaries and a school at Kwigillingok attracted residents from larger winter settlements nearby. However, within the past two decades Kwigillingok has been subject to fissioning as a significant portion of the population resettled the site of Kongiganak.

When Nelson traveled this section of the coast in 1878 most of the winter settlements he encountered were small. Similarly, even today none of the three communities along the north shore of the Kuskokwim (Kipnuk, Kwigillingok and Kongiganak) approach the size of Hooper Bay. The differences in size and population stability is perhaps attributable to differences in the local habitat, environmental conditions, variations in the resource base and the subsistence economy.

Hooper Bay is located in an area of diverse geographical features ranging from marshy lowlands to basaltic outcroppings. The area around the community is drained by an extensive, complex system of rivers, of which many empty into the local bays. Hooper Bay's location on one of these small bays with mountains and another bay to the north provides its residents with different options for pursuing resources than those available to Kwigillingok residents.

In contrast, Kwigillingok is located in a relatively homogeneous geographic area of generally low relief. The rivers and sloughs draining this area of numerous shallow ponds and lakes are short and tend to freeze nearly solid in the winter. The village is located on the north shore of Kuskokwim Bay and twenty miles from the mouth of the Kuskokwim River. The relatively straight coastline with no small bays nearby means that all coastal activities must take place in the waters of the extremely large Kuskokwim Bay and beyond into the Bering Sea. The village is prone to flooding and storm damage due to the low relief.

The divergent natural settings have resulted in certain variations in resource availability and subsistence harvest patterns between the two communities. Hooper Bay's location on a small, shallow bay provides its residents with a relatively sheltered area to fish and hunt except when

storms emerge from the west and southwest. The many streams that empty into Hooper Bay and the extensive tidal areas host sculpin, starry flounder, Bering cisco and tomcod. Herring and salmon are harvested near Nuok Spit. Belukha and seals are found in the bay and up some of the larger rivers during the fall. The deeper Kokechik Bay (north of Hooper Bay) is the site of additional resources such as spawning herring and sea lions, and the marshes along the south shore provide nesting habitat for dense colonies of brant and cackling Canada geese as well as other waterfowl species, gulls, and terns.

By contrast, Kuskokwim Bay is so large that it provides relatively little shelter to the residents of the communities situated along its north shore like Kwigillingok. Most fishing for sculpin, yellow-fin sole, Bering cisco, and tomcod by Kwigillingok takes place at the mouth or the lowest stretches of the Kwigillingok River. The Ishkowik River and other local sloughs are also fishing sites, but travel to these areas is occasionally restricted since this section of the coast is less protected. Kwigillingok does not have spawning herring, belukha, or salmon occurring close by. It does have access to seals and walrus both in the spring and fall. The sandbar islands west of the village are haul out sites for spotted seals during the summer. The area around Kwigillingok does not support dense summer colonies of geese and other waterfowl species. Most hunting activities coincide with peak numbers of birds encountered during migration.

Patterns of winter subsistence activities also differ somewhat between the two communities which are probably attributable to variations in the local environment. The jutting, rocky Cape Romanzof and the deeply carved physiography of the coastline around Hooper Bay probably influence

the formation of ice and help create fracture zones during the winter. This creates conditions which are favorable for hunting seals near the village. Generally the winter ice conditions are considered too unstable around Kwigillingok to permit the hunting of seals during that time. Also the shorefast ice frequently extends for several miles off the coast, so hunting takes place at a distance from the community. For the most part the hunting of seals takes place primarily during the spring and fall with some harvest in the summer. This appears to have been the pattern in the past also.

The variety of winter fish resources is one of the most noticeable differences between the two communities. A broader range of resources is available during the winter around Hooper Bay. The presence of extensive, complex systems of rivers probably permits a greater variety of fish to remain within the area, such as least cisco, sheefish, humpback whitefish, pike, and burbot. These fish are not found in the vicinity of Kwigillingok; the Bering cisco is only accessible for harvest by Kwigillingok residents during the ice free months. The Bering and least cisco are the major species harvested by Hooper Bay residents during the winter. The harvest of the other fish species also occurs but in lesser numbers and at fewer sites. Possibly because of their short, shallow nature, many of the sloughs and rivers draining the coast around Kwigillingok probably cannot support the varied resources found within the complex river systems near Hooper Bay. Kwigillingok residents must harvest most of their winter food supply prior to freeze-up and winter harvest activities are limited. Hooper Bay residents remain active throughout the winter. The presence of a richer resource base around Hooper Bay may account in part for the larger population size of this community.

The lack of winter resources around Kwigillingok is offset by the community's proximity to the Kuskokwim River and its strong salmon runs. In the past, Kwigillingok residents established fish camps along the Kuskokwim in order to harvest salmon. Currently residents still harvest Kuskokwim salmon runs while operating from the community. The strength and stability of these runs ensures that Kwigillingok residents are able to harvest enough salmon for their winter food supply.

Hooper Bay is not close enough to the Yukon or Kuskokwim rivers to allow access for efficient subsistence fishing. Hooper Bay residents harvest salmon within the bay. It is thought that most of these fish are bound for the Yukon River, making Hooper Bay an interception fishery. The appearance of the salmon within the bay is subject to many environmental variables such as prevailing winds, ocean currents, ice conditions and the strength of the salmon runs themselves. Thus, catches may fluctuate from year to year. Hooper Bay's harvest is not as dependable as Kwigillingok's harvest of Kuskokwim River stocks right at the mouth of the Kuskokwim River.

Both communities exhibit their own seasonal round with variations in harvest activities and patterns. As shown above, the variations in patterns are due in part to the communities' location which show differences in geographical features, environmental conditions and the inventory of resources, and their migratory habits. Overall, however, these communities also share some broad similarities because they are both coastal communities of the Yukon-Kuskokwim Delta. Essentially they both share food extractive economies with many similar features.

The food extractive economic systems of these two communities are

based on the interception of natural resources migrations. The systems are therefore influenced by the migration patterns of these resources and the spatial locations of the migrations. The physical location of the villages, seasonal camp sites, specific net and trap sites are often based on identifying corridors through which food products flow and which permit interception of these products. Some, like the marine mammals, herring, salmon, waterfowl, loons and cranes, undertake extensive migrations which pass by Kwigillingok and Hooper Bay. Other resources such as the various whitefish, tomcods, blackfish, burbot, and pike remain in the local area year round, but undertake short migrations which influence their accessibility and harvest. The migratory species are the foundation of the economic systems of both Kwigillingok and Hooper Bay.

The seasonal round of both communities is geared toward the harvest of these migratory resources within short durations of availability. Marine mammals are largely available only during the spring and fall. Encounters with seals during the summer are opportunistic and unpredictable. Seals may be harvested during winter at Hooper Bay by residents with qayaq or canoes. The harvest of herring takes place during a short, one-to-two week period. The harvest of salmon is longer, within a one-to-three month period. Migratory bird species, with the exception of ptarmigan, are available during the ice free months. Their numbers are greatest around Kwigillingok during the spring and fall migrations which only last a few weeks. At Hooper Bay, several birds nest close by the community during the summer, such as brant and cackling Canada geese. Tomcods, burbot, and pike are generally only available during their spawning runs. Whitefish and blackfish also make short migrations that make them acces-

sible during the winter at a few specific sites. Harvest practices of the two communities have developed over the years to intercept these resources at the peak of migration, which may be the only time they are a ccessible.

Not only are resources typically harvested within a short time span of availability, but the spatial locations where many resources are harvested are usually restricted. Marine mammals are harvested in a corridor that is primarily a few miles wide bordering the coastline. Herring and salmon are both harvested in very specific locations. Herring are harvested in shallow inshore areas such as bays and tidal bars during their brief spawning runs. Salmon are intercepted along their migratory route as they head for their spawning streams. They may be intercepted in moderate numbers along the coast and in high numbers as they enter the mouths of the Yukon and Kuskokwim Rivers. Blackfish are found primarily in freshwater streams and ponds with no salt intrusion. Mink and land otter are principally harvested within stream systems. Hare and ptarmigan densities are highest in areas with extensive willow brush. Burbot and pike are only found in highly specific locations. Over time, the economic systems of these communities have developed a seasonal round of food extractive activities that incorporate both specific timing and location features.

As extensively discussed in previous chapters, the seasonal rounds of both communities were shown to be influenced by environmental conditions such as climatic and ice conditions that create annual and seasonal fluctuations in the economy. The unavailability of a particular resource in any given year could be critical, particularly if it is one of the major sources of food. Both communities appear to have adapted to these

biological and environmental fluctuations by incorporating a relatively wide range of wild resources into their economy. They have developed skills and knowledge about other resources to broaden their economic base and to minimize the impact of a failure of a critical resource.

A requirement of this type of system of resource use is that it remain flexible and adaptive. The local system incorporates new resources when they become available. This has been illustrated in recent times by the inclusion of beaver harvest into the seasonal round by both communities, even though the presence of beaver around Kwigillingok has been less than two decades and around Hooper Bay for less than one decade. Similarly, herring were incorporated into Kwigillingok's seasonal round as soon as they started appearing in the local tidal areas in the mid 1960s. Conversely, resources at time drop out of the seasonal round. Belukha are rarely harvested at Kwigillingok although they were regularly harvested in the past. This is because belukha visit the area less frequently. Individual instances of harvests of unusual resources for these communities have included killer whale, Pacific white-sided dolphin, polar bear, porcupine, and moose among others. Most resources are considered a potential source of food and possible addition to the resource inventory.

While being a diversifed economy, marine mammals have historically been one of the foundations of the economic system. Three major species of seals were hunted historically and continue to be hunted. Their meat and byproducts, especially seal oil, are important to the communities as a whole and are important as trade products with non-coastal communities. Both communities have socially dictated customs that deal with the distribution of the first seal (in Hooper Bay, bearded seals) taken by a

household. Both also customarily distribute larger marine mammals such as walrus and belukha on a village-wide basis, whenever any are taken. Both Moravian missionaries and Catholic priests documented that both communities had "bladder feasts" which were an important part of the ritual cycle and which honored the souls of the harvested seals in order to ensure their return. In the past, trade of seal products to upriver Kuskokwim communities garnered a significant portion of Kwigillingok's winter dried salmon supply according to knowledgeable residents. The trade of seal oil and other seal products continues although its magnitude is undetermined. Also, partnerships continue to exist today for the purposes of spring seal hunting. These partnerships tend to be stable and persist over time.

The size of the seal harvest in each community varies somewhat each year because of fluctuations in seal populations themselves and the climatic and environmental conditions that occur during the relatively short migration period. However, generally, seal are a fairly reliable resource. It has occurred within historic times, the spring seal migration failed to materialize during the usual time period. This failure lead to a time of starvation in each community. Thus, although seals are a foundation of the local economic system, a wider range of other resources have been incorporated to provide diversity and and a buffer against the failure of any one resource.

In sum, the data gathered during the course of this study suggests that there are differences between the seasonal round of each community due to localized variations in geography, environmental conditions, and resource availability, distribution, and migration patterns. The economic and social systems of these two communities retain an individual character

in response to features of their local setting and resource patterns that have shaped these systems over time. In addition to the distinctive qualities of their individual systems, both communities share broad similarities in resource use. Both have an economic and social system that is tied to the extraction and exploitation of natural resources. Both systems are especially reliant on seals and other marine mammals, while utilizing a wide range of other available resources. These systems are flexible and adaptive, incorporating new resources as they become available and accomodating shifts in their resource base. Because of the inherent nature of food extractive economies, they are sensitive to changes in the resource base. As noted earlier, community residents wish to continue their ability to harvest fish and wildlife resources in the future, especially in light of the weak cash sector of their current economy. Unless there are major changes in the future, these food extractive economies which incorporate a supportive cash component and which are most responsive to changes in environmental conditions and shifts in the local resource base, will continue to be the most viable economic system for these two coastal communities.

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APPENDIX A

YUP'IK ESKIMO TERMS FOR SELECTED
FISH AND WILDLIFE RESOURCES
KWIGILLINGOK[a]

Common English Name	Scientific Name	Local Name
Herring	Clupea Harengus pallasi	Iqalluarpak
King Salmon	Oncorhynchus tsawytscha	Taryaqvak
Chum Salmon	Oncorhynchus keta	Kangitneq
Red Salmon	Oncorhynchus nerka	Sayak
Coho Salmon	Oncorhynchus kisutch	Qakiiyaq
Tomcod	Microgadus proximus	Ceturrnaq
Boreal Smelt	Osmerus eperlanus	Qusuuq
Sculpin	probably Megalocottus platycephalus laticeps	Nertuliq
Bering Cisco	Coregonus laurettae	Imarpinraq
Yellow-fin Sole	Limanda aspera	Naternaq
Needlefish	Pungitius pungitius	Quarruuk
Blackfish	Dallia pectoralis	Can'giiq
Soft-shelled Clam	Mya arenaria	Uiluq
Cockle	Clinocardium nuttalli	Taavtaaq
Bearded Seal	Erignathus barbatus	Maklassuk Maklak (large male) Amirkaq (subadult)
Ringed Seal	Phoca hispida	Nayiq
Spotted Seal	Phoca vitulina largha	Issuriq
Walrus	Odobendus rosmarus	Asveq
Belukha	Delphinapterus leucas	Cetuaq

Common English Name	Scientific Name	Local Name
Mink	*Mustela vision*	Imarmiutaq
Land Otter	*Lutra canadensis*	Cuignilnguq
Red Fox	*Vulpes vulpes*	Kaviaq
Arctic Fox	*Alopex lagopus*	Uliiq
Muskrat	*Ondatra zibethicus*	Tevyuliq or Kanaqlak
Beaver	*Castor canadensis*	Paluqtaq
Snowshoe Hare	*Lepus americanus*	Maqaruaq
Arctic Hare	*Lepus othus*	Qayuqeggliq
Yellow-Billed Loon	*Gavia adamsii*	Tuullek
Arctic Loon	*Gavia arctica*	Tunutellek
Red-Throated Loon	*Gavia stellata*	Qaqaq
Red-Necked Grebe	*Podiceps grisegena*	Qaleqcuuk
Horned Grebe	*Podiceps auritus*	Tusairnaq
Double-Crested Cormorant	*Phalacrocorax auritus*	Uyalek
Whistling Swan	*Olor columbianus*	Qugyuk
Canada Goose	*Branta canadensis*	Tutangayiit
Brant	*Branta bernicla*	Neqlernaq
Emperor Goose	*Chena cangica*	Nacaullek
White-fronted Goose	*Anser albifrons*	Neqleq
Snow Goose	*Chen caerulescens*	Kanguq
Mallard	*Anas platyrhynchos*	Curcurpak
Pintail	*Anas acuta*	Uqsuqaq
Green-Winged Teal	*Anas crecca*	Tengesqar
Blue-Winged Teal	*Anas discors*	Qatgelli

Common English Name	Scientific Name	Local Name
Northern Shoveler	Anas clypeata	Sugg'erpak
Canvasback	Aythya valisineria	Kepalek
Greater Scaup	Aythya marila	Kepalek
Oldsqaw	Clangula hyemalis	Aarraangiik
Steller's Eider	Polysticta stelleri	Anarnisakaq
Common Eider	Somateria mollissima	Metraq
King Eider	Somateria spectabilis	Qengallek
Spectacled Eider	Somateria fisheri	Kaureq
Surf Scoter	Melanitta perspicillata	Akacakayak or Cingayak
Black Scoter	Melanitta nigra	Kukumyar
Red-Breasted Merganser	Mergus serrator	Paiyiiq
Bald Eagle	Haliaeetus leucocephalus	Metervik
Willow Ptarmigan	Lagopus lagopus	Qangqiiq
Sandhill Crane	Grus canadensis	Qucillgaq
Semipalmated Plover	Charadrius semipalmatus	Uyarr'uyaq
Black-Bellied Plover (Winter plumage)	Pluvialis squatarola	Tuuyiik Tuliigaq
Long-Billed Dowitcher	Limnodromus scolopaceus	Pugtatnguartalek
Marbled Godwit	Limosa lapponica	Tevatevaaq or Civikaq
Whimbrel	Numenius phaeopus	Tevatevaaq
Greater Yellowlegs	Tringa melanoleuca	Tuntusikaq
Black Turnstone	Arenaria melanocephala	Qiurracetaaq
Red-Necked Phalarope	Phalaropus lobatus	Imarcaar
Red Phalarope	Phalaropus fulicarius	Ayungnaar

Common English Name	Scientific Name	Local Name
Common Snipe	Gallinago gallinago	Kukukuaq
Pectoral Sandpiper	Calidris melanotos	Iisuayaar
Western Sandpiper	Calidris mauri	Iisuayaar
Dunlin	Caladris alpina	Ceremraq
Parasitic Jaeger	Stercorarius parasiticus	Yungaq
Long-Tailed Jaeger	Stercorarius longicaudus	Enacallngar
Glaucous Gull	Larus hyperboreus	Narusvak
Arctic Tern	Sterna paradisaea	Teqiiyar
Thick-Billed Murre	Uria lomvia	Alpaq
Pigeon Guillemot	Cepphus columba	Eciguraq
Snowy Owl	Nyctea scandiaca	Anipaq
Short-Eared Owl	Asio flammeus	Keneqpatak
Downy Woodpecker	Picoides pubescens	Puugtuyuli
Tree Swallow	Iridoprocne bicolor	Cungakcuarnaq
Common Raven	Corvus corax	Tulukaruk
Black-capped Chickodee	Parus atricapillus	Cekpiipiir
American Robin	Turdus migratorius	Elagayuli
Water Pipit	Anthus spinoletta	Cetaar
Yellow Warbler	Dendroica petechia	Cungakcuarnaq
Rusty Blackbird	Euphagus carolinus	Cuqculi
Common Redpoll	Carduelis flammea	Uqviicar
Snow Bunting	Plectrophenax nivalis	Kanguruaq
Lapland Longspur	Calcarius lapponicus	Tekcitaq

a. This is not a complete list of all the wildlife resources found around Kwigillingok.

APPENDIX B

YUP'IK ESKIMO TERMS FOR SELECTED
FISH AND WILDLIFE RESOURCES
HOOPER BAY[a]

Common English Name		Scientific Name	Local Name
Herring		Clupea harengus pallasi	Iqalluarpaq
King Salmon		Oncorhynchus tshawytscha	Taryaqvaq
Chum Salmon		Oncorhynchus keta	Qavlunaq
Pink Salmon		Oncorhynchus gorbuscha	Cuqpeq
Coho Salmon		Oncorhynchus kisutch	Uqurliq
Starry Flounder		Platichthys stellatus	Uuraruq
Tomcod		Microgaduis proximus	Iqalluaq or Citegtaq
Smelt	possibly	Osmerus eperlanus	Naqecuat
Sculpin	probably	Megalocottus platycephalus laticeps	Kayurlugaq
Bering Cisco		Coregonus laurettae	Naptaq
Least Cisco		Coregonus sardinella	Qassayagaq or Neq'yagaq
Humpback Whitefish		Coregonus pidschian	Qaurtuq
Pike		Esox lucius	Cukvak
Blackfish		Dallia pectoralis	Can'giiq
Needlefish		Pungitius pungitius	Quarruuk
Sheefish		Stenodus leucichthys nelma	Ciiq
Burbot (lush)		Lota lota	Manignaq
Soft-shelled clam		Mya arenaria	Apakussutaq
Cockle		Clinocardium nuttalli	Taavtaaq
Bearded Seal		Erignathus barbatus	Maklak Maklagak (subadult)

Common English Name	Scientific Name	Local Name
Ringed Seal	Phoca hispida	Nayiq
Spotted Seal	Phoca vitulina largha	Issuriq
Walrus	Odobendus rosmarus	Kaugpak or Asveq
Sea lion	Eumetopias jubatus	Uginaq
Belukha	Delphinapteras leucas	Cetuaq
Mink	Mustela vision	Imarmiutaq
Land Otter	Lutra canadensis	Cinkaq
Red Fox	Vulpes vulpes	Kaviaq
Arctic Fox	Alopex lagopus	Qunguiq
Muskrat	Ondatra zibethicus	Kanaklaq
Beaver	Castor canadensis	Paluqtaq
Snowshoe Hare	Lepus americanus	Maqaruaq
Tundra Hare	Lepus othus	Qayuqeggliq
Yellow-billed Loon	Gavia adamsii	Tuullek
Arctic Loon	Gavia arctica	Tunucillek
Red-throated Loon	Gavia stellata	Qaqatacik
Red-necked Grebe	Podiceps grisegena	Aarayuli
Sooty Shearwater	Puffinus griseus	Ukuik
Double-crested Cormorant	Phalacrocorax auritus	Uyalek or Uyalegpak
Tundra Swan	Cygnus colombianus	Qugyuk
Canada Goose	Branta canadensis	Nangi'lagiq and Tuutangayak
Brant	Branta bernicla	Neqlernaq
Emperor Goose	Chen canagica	Nacaullek

Common English Name	Scientific Name	Local Name
Greater White-fronted Goose	Anser albifrons	Neqleq
Snow Goose	Chen caerulescens	Kanguq
Mallard	Anas platyrhynchos	Yuukarpak
Pintail	Anas acuta	Yuukaq
Green-winged Teal	Anas crecca	Tengesqaaraq
Blue-winged Teal	Anas discors	Qatkeggliq
Northern Shoveler	Anas clypeata	Cug'erpak
Greater Scaup	Aythya marila	Kepalek
Oldsquaw	Clangula hyemalis	Aarrangiiraq
Common Eider	Somateria mollissima	Aangikvak or Angucaluq
King Eider	Somateria spectabilis	Metraq
Spectacled Eider	Somateria fischeri	Qaugeq
Black Scoter	Melanitta nigra	Kukumyaraq
Red-breasted Merganser	Mergus serrator	Payiq
Peregrine Falcon	Falco peregrinus	Eskaviaq
Willow Ptarmigan	Lagopus lagopus	Aqeygiq
Rock Ptarmigan	Lagopus mutus	Elciayuli
Sandhill Crane	Grus canadensis	Qucillgaq
Semi-palmated Plover	Charadrius semipalmatus	Uyarr'uyaq
Black-bellied Plover	Pluvialis squatarola	"Tuigak"
Bar-tailed Godwit	Limosa lapponica	"Uliyarneq"
Greater Yellowlegs	Tringa melanoleuca	Tuntusukangaliyak
Black Turnstone	Arenaria melanocephala	Cilmak

Common English Name	Scientific Name	Local Name
Red-Necked Phalarope	*Phalaropus lobatus*	Teleqcaaraq
Red Phalarope	*Phalaropus fulicaria*	Augtuaraq
Common Snipe	*Gallinago gallinago*	Kukukuaq
Western Sandpiper	*Calidris mauri*	Iiyuraaraq
Dunlin	*Calidris alpina*	Curemraq
Parasitic Jaeger	*Stercorarius parasiticus*	Cungarrlugaq
Glaucous Gull	*Larus hyperboreus*	Naruyaq
or		
Glaucous-winged Gull	*Larus glaucescens*	Naruyaq
Herring Gull	*Larus argentatus*	Naruyacuaq
Sabine's Gull	*Larus philadelphia*	Nacallngaraq
Arctic Tern	*Sterna paradisaea*	Teqiyaraq
Thick-billed Murre	*Uria lomvia*	Alpaq
Snowy Owl	*Nyctea scandiaca*	Anipaq
Short-eared Owl	*Asio flammeus*	Anipausugaq
Downy Woodpecker	*Picoides pubescens*	Pugugtuyuli

a. This is not a complete list of all resources found around Hooper Bay.

APPENDIX C.

SELECTED ETHNOBOTANY: KWIGILLINGOK[a]

NAME	HARVEST PERIOD	PART USED	USAGE	STORAGE
1. Kapuukaraarq (Ranunculus pallasii) Pallas' buttercup	Late April-early May (from the margin of ponds before flowers develop) Mid-September-mid-October.	shoots	cooked in soup; eaten alone or with seal oil after boiled	freeze
2. Ikiituk (Angelica lucida) wild celery	May-early June ("before salmon")	stalk	stalk is peeled (raw) and eaten with seal oil	none
3. Kaagpak (Senecio congestus) "wild celery"	June	stalk	stalk is peeled and cut up to make a "salad" or eaten with seal oil	none
4. Allngiguaq (Caltha palustris) cowslip	June	stems and leaves	cooked in water with seal oil; added and eaten alone or with seal oil	freeze as is; put in jars; after cooking and freeze jars
5. Ayuq (Ledum palustre) Labrador Tea	May-October	leaves and stems	boiled alone for tea or added to storebought tea; plant burned and aroma inhaled as medicine for chronic headaches and other ailments; plant used as poultice for sores by applying directly or after the plant has been boiled.	kept in cold place (porch, freezer, refrigerator); Plant crumbles when dried

NAME	HARVEST PERIOD	PART USED	USAGE	STORAGE
6. Quagciq (Rumex articus) sourdock	July	leaves	cooked in water; used in akutaq with berries or salmon eggs (Makaq); eaten raw with seal oil	cook and store in container for short time. Past: cook and put in barrel to be buried in the ground. Barrel re-trieved after freeze-up. Past: put in with salmonberries (when this was done this plant was picked in August after the berries)
7. Caiggluk (Artemesia tilesii) "stinkweed"	June-August	stems and flowers	Medicinal; dried and mashed to make poultice for cuts the dried plant is also used in steam-baths by slapping sore joints; boiled to make medicinal juice	dried
8. Naunraq (Rubus chamoerus) "salmonberry" cloudberry	late July-mid-August	berry	used to make akutaq with crisco and other berries or tomcod livers.Past: used as medicine for dry throats	frozen
9. Puyuraaq (Rubus articus)	Late July-mid-August	berry	used with salmon-berries in akutaq (these berries are hard to find in large quantities)	frozen
10. Tan'gerpak (Empetrum nigrum) crowberry	late August-September	berry	used alone or with salmonberries to make akutaq	frozen; Past: stored in sack or barrel in pond until after freezeup

NAME	HARVEST PERIOD	PART USED	USAGE	STORAGE
11. Tumagliq (Vaccinuum vitis-idaea) Lowbush cranberry; Lingonberry	mid September-October late April-early May	berry	used with other berries to make akutaq; Past: berry juice used as medicine for snow blindness	frozen. Kept in cool storehouse
12. Kavlak (Arctostaphylos alpina) Bearberry	September-October late April-early May	berry	eaten immediately; occasionally used for jam; some people pick them in the spring and use in akutaq	not stored except as jam
13. Utngungssaraat (Equisetum silvaticum and E. arvense) Horsetails "Mousefoods"	mid-September-October	roots	cooked in soup or eaten alone; eaten raw; made into akutaq	frozen
14. Anlleq = root Iitaq = base of stem Kelugkaq - upper stalk (Eriophorum agustifolium) Cottongrass The root is a component of "mousefoods"	mid-July-mid September	whole plant	roots used as are other "mousefoods" (see above); base of stalk may be peeled, put in water and eaten after dinner; may also be used in akutaq. The rest of stalk is used for fish ropes.	the roots are frozen

NAME	HARVEST PERIOD	PART USED	USAGE	STORAGE
15. Neg'asek (species unknown) Another component of "mousefoods"	mid September-October	roots	roots used as are other "mousefoods"; these taste similar to potatoes	frozen
16. Taperrnat (Elymus arenaria mollis) Lyme grass "basketgrass"	late August-October	stalk (use plants without spikelets-local term "female plants")	used to make basketry items; as stickery in sealgut rain-coats	dried in mat form
17. Canget (Poa spp) "boot grass"	mid-September October	stalk	they are picked after they are dead. Used as in-sulation in boots Past: used as mats on beds	kept in bundles in storehouses
18. Tayarut (Hippuris vulgaris) goose grass "wild onion"	late October-early November (freeze-up)	stalk	cooked and added to seal or bird broth with fish eggs and livers added-(eskimo soup); Also made into akutaq with fish eggs of any kind	stored in bag outside on tundra all winter.
19. Cetuuguat (Dryopteris dilatata) fern	mid to late May	fiddleheads roots are found in mouse caches	none	

NAME	HARVEST PERIOD	PART USED	USAGE	STORAGE
20. Cingqullektat (cornus suecica and C. canadensis x suecica) Bunchberry	mid-August-mid-September	berry	picked and eaten immediately as snack	none
21. Uingiaraat (Oxycoccus microcarpus) Bog cranberry	mid September-October late April early May	berry	picked and eaten immediately	none
22. Qaltaruaq (Petasites frigidus) colts foot	mid-September-October	leaf	use leaf ash with tobacco	dry when the plants are "old". Burn them in a can
23. Tarnaq (Heracleum lanatum) Cow parsnip (plant grows upriver from the village not around the village)	probably June	stalk	peeled and eaten immediately	none
24. Angukaq (Polygonum alaskanum) Wild Rhubard (plant grows up-river from the village, not around the village	June	leaves	Made into akutaq like qaugciq	

a. The plants listed here are not a complete list of all the plants used for food, medicine or other purposes by community residents.

APPENDIX D.

SELECTED ETHNOBOTANY: HOOPER BAY[a]

NAME	HARVEST PERIOD	PART USED	USAGE	STORAGE
1. Kapuukaraaq (*Ranunculus pallasii*) Pallas buttercup	Late April–June (gathered from margins of ponds)	Young shoots	cooked and eaten with seal oil made into akutaq	some people freeze after the plant has been cooked.
2. Allmaruaq (*Caltha palustris*) cowslip	June (before they flower)	stems and leaves	boiled with seal oil and eaten	some people freeze the plant after cooking it or as is.
3. Ikiituk (*Angelica lucida*) wild celery	mid-late July	stalk	stalk is peeled and eaten raw; occasionally put on top of wood for smoking fish	none
4. Aatunaq (*Rumex arcticus*) Sourdock	August	leaves	boiled and eaten; put into barrel after cooked, crow-berries added to make akutaq	boiled and stored in barrels in a cool place-can last a whole year; Past: used to line pits where salmonberries were buried. After freezeup, both plants and berries were re-trieved.
5. Tayaruq (*Hippuris vulgaris*) goosegrass	Late October-early November (gather after freeze-up	stalks	boiled and mixed with fish eggs (esp. tomcods) or mousefoods to make soup.	store in a sack as is.

NAME	HARVEST PERIOD	PART USED	USAGE	STORAGE
6. Ayuq (Ledum palustre) Labrador tea	throughout the snow-free months-peak time is right after the snow melts	stems and leaves	added to store-bought tea or used alone	dried
7. Aqevyiq (Rubus chamoerus) "salmonberry" cloudberry	Late July-mid-August	berry	made into akutaq with crisco and other berries or tomcod livers; eaten with sugar and seal oil (akumaarrluk)	Freeze; pack into barrels and store in a cool place; Past: buried in pits lined with sourdock
8. Puyurniq (Rubus articus) Nagoonberry (berries are not numerous)	Late July-mid-August (only picked when available, usually only get enough for immediate consumption)	berry	made into akutaq with salmonberries	none
9. Kavlakuaq (Empetrum nigrum) "blackberry" crowberry	Late August-September	berry	made into akutaq with other berries or sourdock Past: used as dye	Freeze; put in sacks and store in ponds until after freezeup; put in barrels with lingonberries.
10. Tumagliq (Vaccinium vitis-idaea) Lowbush cranberry Lingoonberry	mid-September-October late April-early May	berry	Used in akutaq occasionally used as dye. Made into jam. Past: used as medicine for teething babies.	Freeze; put in barrels with blackberries.

NAME	HARVEST PERIOD	PART USED	USAGE	STORAGE
11. Taperrnaq (probably Elymus arenaria mollis) (Basketgrass) Lymegrass	mid-September-early November	stem (pick plants without spike-lets)	used to make basketry items, part of stichery in sealgut raincoats	dry in mats
12. Can'get (Poa spp.)	mid-September-October	stem	used as insulation in boots	store as bundles in store houses
13. Utngungssaaq (Equisetum silvaticum and E. arvense) part of "mousefoods"	mid-September-mid-October	root	cook in soup with tomcod or other fish eggs; make into akutaq but with no berries added	can freeze as is or put in sacks after washing to be stored outside.
14. Iitaq (Eriophorum aqustifolium) cottongrass roots are a component of "mousefoods"	August-mid October	base of stem roots	base of stems eaten by themselves or boiled and cut up made into akutaq without sugar; roots are used similar to other "mousefoods"	roots are frozen; Past: stems buried in pits similar to berries
15. Almaruaq (Epilobium aqustifolium) Fireweed (roots are a component of "mousefoods"	mid-September-mid-October	roots	used similar to other "mousefoods"	frozen
16. Caiggluk (Artemesia telesii) stinkweed	mid-August-September	stems and leaves	boiled to make a medicinal extract and juice-leaves discarded (some sources say use of this plant is recent within the past decade)	dried as is; juice is stored in cool spot

NAME	HARVEST PERIOD	PART USED	USAGE	STORAGE
17. Cingqullektaq (Cornus suecica and C. canadensis x suecica) bunchberry	August	berry	picked and eaten immediately as a snack	none
18. Curaq (Vaccinium uliginasum) Blueberry	August (these berries are not numerous in this area)	berry	used in akutaq	frozen
19. Uskuraaleq (Oxycoccus microcarpus) Bog cranberry	mid-September-October late April-early May	berry	can be used similar to lingonberries. (Not often picked since these berries are small and are slow to pick)	similar to lingonberries
20. Ceturnaq (Dryopteris dilatata) Fern	this plant used in the distant past			
21. Angukaq (Polygonum alaskanum) wild Rhubarb (only grows in the Askinuk Mountains)	July-August	leaves	eaten similar to sourdocks (aatunaq)	Boil and put in barrel

NAME	HARVEST PERIOD	PART USED	USAGE	STORAGE
22. Quunaraat (Oxyria digyna) sourgrass (not common in this area)	picked when they are encountered	leaves	picked and eaten immediately	none
23. Itgaraalek (Ligusticum hultenii) wild celery	mid-May-early June	stems and leaves	boiled and eaten	none

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a. The plants listed here are not a complete list of all the plants used for food, medicine or other purposes by community residents.

APPENDIX E.

SEASONAL ROUND FOR SELECTED RESOURCES: KWIGILLINGOK

RESOURCE, ENGLISH AND YUP'IK		MONTHS HARVESTED																							
		M		A		M		J		J		A		S		O		N		D		J		F	
Bearded Seal	Maklassuk	–	x	x	x	x	–	–					–	–	x	x	–	–							–
Ringed Seal	Nayiq	x	x	x	x	x	–	–					–	–	x	x	–	–							–
Spotted Seal	Issuriq	x	x	x	x	x	–	–				–	–	–	x	x	–	–							–
Walrus	Asveq				–	x	–						–	–	–	x	–								
Bering Cisco	Imarpinraq					x	x	–	–	–	–	–	x	x	–										
Herring	Iqalluarpak					x	x	–																	
King Salmon	Taryaqvak						–	x	x																
Chum Salmon	Kangitneq								x	x	x														
Red Salmon	Sayak								x	x	x														
Coho Salmon	Qakiiyaq										–	x	x												
Sculpin spp.	Nertuliq							–	–	–	–	x	x	x	–										
Yellow Fin Sole	Naternaq							–	–	–	–	x	x	x	–										
Tomcod	Ceturrnaq													–	x	x	x	–	x	x	–				
Boreal Smelt	Qusuuq													–	–	–	–	–	–	–	–				
Blackfish	Can'giiq	–	–															–	x	x	x	x	x	–	–
Needlefish	Quarruuk	–	–															–	–	–	–	–	–	–	–
Clams	Uiluq							–	–	–	–	–	–	–											
Mink	Imarmiutaq																	x	x	x					
Land Otter	Cuignilnguq	–	–															x	x	x	–	–	–	–	–
Red Fox	Kaviaq																	x	x	x	x	–			
Arctic Fox	Uliiq	x	x																				–	x	x
Snowshoe Hare	Maqaruaq	x	x	–														–	–	–	–	–	–	x	x
Tundra Hare	Qayuqeggliq	x	x	–														–	–	–	–	–	–	x	x
Willow Ptarmigan	Qangqiiq	x	x	x	–																	–	–	x	x
Salmonberries	Naunraq											x	x	–											
Crowberries	Tan'gerpaq												–	x	x										
Lingonberries	Tumagliq				–	–	–							x	x	x	–								
Basket Grasses	Taperrnat												–	–	x	x	x								
Mousefoods	See Appendix C													–	x	x	x								
Driftwood		–	–				–	–	–	–	–	–	–	X	X	X	–	–	X	X	X	X	X	X	X
		M		A		M		J		J		A		S		O		N		D		J		F	

xxxx usual harvest period
---- intermittent harvest period

APPENDIX F.

SEASONAL ROUND FOR SELECTED RESOURCES: HOOPER BAY

RESOURCE, ENGLISH AND YUP'IK		MONTHS HARVESTED																							
		M		A		M		J		J		A		S		O		N		D		J		F	
Bearded Seal	Maklak	x	x	x	x	x	-	-					-	-	x	x	-								
Ringed Seal	Nayiq	x	x	x	x	x	-	-					-	-	x	x	-				-	-	-	-	-
Spotted Seal	Issuriq	x	x	x	x	x	-	-				-	-	-	x	x	-								-
Walrus	Kaugpak			-	-	-	-						-	-	-										
Belukha	Cetuaq		-	-	-	-	-						-	x	x	-									
Bering Cisco	Naptaq	x	-						-	-	-	x	x	x	x	-		x	x	x	x	-	-	-	x
Herring	Iqalluarpaq					-	x	-																	
King Salmon	Taryaqvaq						-	x	x																
Chum Salmon	Qavlunaq						-	x	x																
Humpback Salmon	Cuqpeq						-	x	x																
Starry Flounder	Uuraruq						-	x	x	x	x	x	x	-											
Tomcod	Iqalluaq		-	x	x								-	x	x	x	-	x	x	-					
Sculpin spp.	Kayurlugaq						-	x	x	x	x	x	x	-											
Least cisco	Qassayagaq	x	-									x	x					x	x	x	x	-	-	-	x
Pike	Cukvak		x	x							-	-	-												
Blackfish	Can'giiq	-	-											-	-	-		x	x	x	x	x	x	x	-
Needlefish	Quarruuk											-	-					-	-	-	-	-	-	-	-
Burbot	Manig'naq	x																							x
Mink	Imarmiutaq																	x	x	x					
Red Fox	Kaviaq																	x	x	x	x	-			
Arctic Fox	Qunguiq	x	x																				-	x	x
River Otter	Cin'kaq	-	-															x	x	x	-	-	-	-	-
Snowshoe Hare	Maqaruaq	x	x	-														-	-	-	-	-	-	x	x
Tundra Hare	Qayukeggliq	x	x	-														-	-	-	-	-	-	x	x
Willow Ptarmigan	Aqeygiq	x	x	x	-																	-	-	-	x
Rock Ptarmigan	Elciayuli	-	-	-	-												x	x	x	x	x	x	x	x	x
Salmonberries	Aqeviq										x	x	-												
Crowberries	Kavlakuaq												-	x	x	x									
Lingonberries	Tumagliq				-	-	-							-	x	x	-								
Basketgrasses	Taperrnat													-	x	x	x								
Mousefoods	See Appendix D													-	x	x	x								
Driftwoods		-	-	-	-	-	-	-	-	-	-	-	-	x	x	x	-	x	x	x	x	x	x	x	x
		M		A		M		J		J		A		S		O		N		D		J		F	

xxxx usual harvest period
---- intermittent harvest period