THE USE OF FISH AND WILDLIFE RESOURCES IN TYONEK, ALASKA

Tubughna Ch'adach' Elnen Ghuhdilt'a

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ABSTRACT

This report describes the contemporary harvest and use of wild fish and game resources in the community of Tyonek, on upper Cook Inlet in southcentral Alaska. Tyonek had a population of 273 in January 1984. Most of the population is Dena'ina Athapaskan Indian. The Division of Subsistence, Alaska Department of Fish and Game, collected resource use and other socioeconomic data in the village from February 1980 through January 1984. Research methods included key respondent interviews, mapping, literature reviews, participant-observation, case studies, and systematic household survey.

The report contains an overview of the history of the Upper Inlet region, and a description of resource use patterns in the late 18th, 19th, and early 20th centuries. Also reviewed is the natural environment of the Tyonek area, as well as the socioeconomic conditions in the village during the study period. In 1983, 39 percent of the households in Tyonek had members engaged in commercial set net fishing in Cook Inlet. About 74 percent of the households had members with wage employment, mostly funded through government programs. Most wage employment was seasonal however, with 70 percent of the households employed for nine months or less in 1983. In 1980, the mean household income in Tyonek was \$13,441, 30 percent below the state's average.

The division's research findings demonstrate that hunting and fishing for local use played a major role in Tyonek's economy and way of life during the early 1980s. Tyonek residents used a 750 square mile area on the west side of Cook Inlet and a 135 mile stretch of the Inlet's shore for harvesting wild foods. Hunting, fishing, and gathering wild resources followed a seasonal round of activities, conditioned by resource presence, weather, and hunting and fishing regulations. Participation in resource harvest activities was high. For example, according to the results of a survey of 100 percent of the village households, in a 12 month period from February 1983 through Janaury 1984 about 82 percent of the households fished for salmon, 69 percent hunted moose, 64 percent collected plants, 49 percent hunted waterfowl, 39 percent hunted small game, and 26 percent fished for hooligan. Harvesting some resources, such as marine mammals and shellfish, required special skills or equipment, and were therefore taken by fewer households. Nevertheless, because of extensive resource distribution networks which followed lines of extended kinship, many community households used these resources. Moose and salmon products were also widely shared, as were fishing and hunting equipment and facilities, such as fishcamps, nets, and smokehouses.

Harvest quantities recorded during the household survey in January 1984 were among the highest reported for any community in southcentral Alaska. For the 12 month period in 1983-84, Tyonek households harvested a mean of 964 pounds dressed weight of wild fish, game, and plants. The per capita harvest was 272 pounds. About 71 percent of this harvest was salmon, and 21 percent was moose. Resource harvesting and processing groups in Tyonek were mostly composed of members of extended families. These multi-household units contained a pool of individuals with the necessary skills to harvest, process, and preserve wild foods. A variety of traditional and more modern methods of processing and preserving wild resources were employed in Tyonek, including smoking, salting, canning, and freezing.

The report concludes that Tyonek's economy during the study period was characterized by the features of mixed, subsistence-based socioeconomic systems in Alaska. These include traditional systems of land used and occupancy, a seasonal round of production activities, high levels of production and participation in resource uses, a domestic mode of production, and networks of distribution and exchange.

Tyonek's use of fish and game has been affected by the rapid population growth and socioeconomic changes of the Cook Inlet region, brought about largely by commercial resource developments. Wildlife habitat preservation, hunting and fishing regulations which accomodate traditional uses, and full participation by the village in the planning of future development will be essential for the protection of Tyonek's traditional uses of fish and wildlife withn one of Alaska's most dynamic regions.

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CHAPTER 1

INTRODUCTION

PURPOSE OF THE STUDY

This report describes the contemporary patterns of wild resource use in the community of Tyonek, southcentral Alaska. Tyonek is a primarily Dena'ina (Tanaina) Athapaskan Indian community of 273 people located 43 air miles southwest of Anchorage on the western shore of Cook Inlet (Fig. 1). The Alaska Department of Fish and Game, Division of Subsistence collected natural resource use and other socioeconomic data in Tyonek for four years between May 1980 and June 1984. This report is based largely upon this research, but also draws upon other written sources.

The division's research in Tyonek began in response to requests from the Alaska Boards of Fisheries and Game for information relating to resource allocation issues. The project continued in an effort to gather information useful in identifying potential socioeconomic impacts of proposed coal and other resource development activities on the west side of northern Cook Inlet. Several interim reports addressing specific resource issues were prepared during the four-year study period. Among the issues and topics addressed were: (1) a general overview of resource uses and socioeconomic conditions in Tyonek, used by the Board of Fisheries in considering the reinstatement of a subsistence king salmon fishery near the village in 1979 and 1980 (Stickney 1980); (2) a description of the 1980 subsistence king salmon fishery near Tyonek (Stanek and Foster 1980); (3) a description of the use of shellfish by



Figure 1. The Cook Inlet region, Alaska.

residents of Tyonek, presented to the Board of Fisheries when considering changes to the subsistence shellfish regulations in Cook Inlet in 1982 (Stanek, Fall, and Foster 1982); (4) documentation of the use of moose and other resources by Tyonek residents to provide baseline data for identifying and monitoring the potential impacts of commercial development of the Beluga coal fields (Foster 1982a); (5) further documentation of king salmon fishing and the annual round of resource harvests, presented to the Board of Fisheries (Foster 1982b); and (6) information about the use of moose by Game Management Unit (GMU) 16B residents, used by the Board of Game in revising moose hunting regulations in 1983 and 1984 (Fall, Foster, and Stanek 1983). Also, Tyonek was included as a case community in a study of resource uses and socioeconomic systems in Alaska (Fall 1983; Wolfe and Ellanna 1983). In addition, division staff have used data from ongoing research when working with other resource management agencies in assessing the potential effects on local patterns of resource use of recreational, agricultural, mineral, hydroelectrical, geothermal, and oil and gas development, as well as land disposals, forestry management, and the construction of transportation systems.

The present report summarizes previous findings of the aforementioned technical papers as well as new information collected in 1983 and 1984. It is intended to be a comprehensive description of contemporary resource harvests and uses in Tyonek as they occurred from the late 1970s up to 1984. Also, this report summarizes current socioeconomic information, provides descriptions of historical resource use activities, and discusses factors influencing resource uses in Tyonek today. The purpose of the report is to present information that can be used in

resource development and allocation decisions by Tyonek residents, the village council and village corporation, government agencies, resource developers, and other interested researchers. The report will serve as a base of information for understanding the role of fish and game resource uses in Tyonek and other modern-day Alaskan communities, and for assessing potential changes to this way of life. This information will also contribute to an understanding of the changes and the continuities in resource use activities which have occurred over the past 200 years in the Upper Cook Inlet region.

Major findings of the research in Tyonek revealed that the majority of Tyonek households during the study period participated in a mixed economy based upon seasonal wage employment and other sources of cash, and extensive use of wild fish and game resources. Salmon and moose provided the bulk of the resource harvest, but notable quantities also were harvested of other resources such as shellfish, marine mammals, and waterfowl. Levels of participation in these activities were generally high, and were scheduled within a recurring seasonal cycle. Harvests took place mostly within a 750 square mile area surrounding the village and along a 135 mile stretch of the western shore of Cook Inlet. Resource harvesting and processing activities were shaped by extended kinship ties. Sharing of equipment, facilities, and raw and prepared fish, game, and plant resources was extensive. In short, the role of wild resource harvest and use in the ongoing life of the community remained highly significant.

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The major objectives of the study were:

- To map locations (land and water) of current and historical resource use areas known to knowledgeable residents;
- To document the variety and quantities of wild resources used annually;
- To describe the annual seasonal round of resource harvest and other economic activities;
- 4. To document the ways in which wild resources are utilized, including the methods of preservation and preparation, and patterns of sharing and exchange among community members;
- 5. To describe the organization of resource harvest groups and processing groups, and describe the social roles involved in fishing and hunting activities.

METHODOLOGY

Research in Tyonek by the Division of Subsistence began in 1980 with a survey of household resource uses administered to 40 heads of households (Stickney 1980). Early fieldwork in the village in 1980 was designed to monitor and observe the newly reinstated king salmon fishery. This provided a period of relatively unstructured presence in the community which enabled researchers to gain the support and confidence of local residents, to become familiar with activity cycles, and to develop an understanding of how to conduct themselves and their

work in the community. Following this period of familiarization, several research designs were prepared to guide the collection of information about specific resource issues and to gain a comprehensive overview of resource uses in the community. All study designs were reviewed and approved by Tyonek Village Council members prior to implementation.

During the four year study period several different data collection methods were used depending on the kind of information required and the amount of time available to the researchers. A chronological summary of those methods, the types of data collected, and their incorporation in published reports is provided in Table 1.

Resource harvest and use data

Throughout the study period, household interview and survey forms were used to guide the collection of resource harvest and use data. The reader should consult the cited interim reports for more detailed accounts of data gathering methods and copies of the interview guides and survey forms. Sample selection methods varied. Information on moose hunting (Foster 1982a), fish camp and smokehouse usage (Foster 1982b), clamming (Stanek, Fall, and Foster 1982), and marine mammals (Appendix A) was collected by compiling a list of active moose hunters (n=40), marine mammal hunters (n=12), fish camp owners (n=28), smokehouse owners (n=18), and "clamming leaders" (n=6). In each case, 100 percent of each of these groups were interviewed. For the collection of seasonal round information and data on household participation in resource harvest activities (Foster 1982b), a sample of 39 village households (52 percent), all known to contain active and

TABLE 1. SUPPART OF RESEARCH METHODS, TIONER, 1960-196	TABLE	1.	SUMMARY	OF	RESEARCH	METHODS,	TYONEK,	1980-19	18
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DATE	method ¹	TOPICS	report ²
February 1980	Household survey	General resource use & other socioeconomic	Stickney 1980
Spring/Summer 1980	Field observations, informal household interviews	Salmon harvest and use	Stanek and Foster 1980
Spring/Summer Fall.	Household inter-	Shellfish harvest and	Stanek,
1981	views, mapping	use	Foster 1982
Spring/Summer 1981	Participant obser- vation	Salmon harvest	Foster 1982b
Fall 1981	Field observation	Moose harvest and general resource use; Maps	Foster 1982a; Fall, Foster Stanek 1983
Winter 1981-	Hunter interviews	11	Foster 1982a,b
Winter 1981- 1982	Mapping	11	Foster 1982b
Summer 1982	Household survey	Salmon use patterns; annual seasonal round	Foster 1982b
	Participant obser- vation	Marine mammal use	
Winter 1984	Household survey	Resource harvest esti- mates and use; socio- economic information	

¹In addition to the particular data gathering technique used at specific times during the study, field notes recorded observations and additional information about wild resource use patterns of Tyonek residents.

 $^2\ensuremath{\text{Listed}}$ are reports which summarize some of the data collected during that study period.

knowledgeable resource harvesters, was selected with the assistance of key respondents and interviewed. Finally, in 1984 a survey of all 80 households in the village was accomplished. This survey collected data on household harvest and use of all locally available species, as well as other socioeconomic and demographic data (Appendix B). The results were entered onto a computer file and analyzed with the Statistical Package for the Social Sciences (SPSS) program.

Resource Use Area Mapping

Mapped information was collected through structured interviews with knowledgeable individuals about the areas utilized by their households. They were asked to indicate areas by drawing lines around the outer extent of their harvesting activities on 1:63,630 United States Geological Survey maps. Community maps were then compiled by aggregating household maps and circumscribing the outer limits of the households' use areas. Use areas depicted in this study are those geographic areas utilized during the search and harvest of wild resources. For moose hunting, geographic areas were mapped for the 1981 September season and the 1983-84 September, November, and January seasons, as well as those areas used during 1978-82, the previous five years. All 46 active moose hunting households drew maps. Other resource categories mapped included black bear, furbearers, small game, freshwater fish, plants and berries, salmon, marine mammals, shellfish, eulachon, and coal. In all cases areas mapped were those utilized during 1978-82; these are considered "current use areas." For each category, all households known to actively harvest that resource prepared maps. After all mapped data were compiled, the maps were reviewed with the village

council, fish and game advisory committee members, and other knowledgeable village residents before being released for publication. In addition, a large map depicting Dena'ina place names and the current extent of land use was presented to the Tyonek Village Council in 1983 and was displayed in the community center for public comment and review.

Networks of Distribution and Exchange, Composition of Harvesting and Processing Groups

Data for case examples of harvesting and processing groups, and of resource sharing networks were collected by two methods. First, survey instruments and interview guides contained questions about hunting partnerships, the sharing of fish camps and smokehouses, and the distribution of harvests. In 1981 each successful moose hunter traced the distribution of his harvest. In 1982, all fish camp and smokehouse owners were interviewed about the sharing of their facilities with other village members. In 1983 and 1984, key respondent households described their harvesting activities during structured interviews, and assisted the researchers in depicting resource sharing in kinship diagrams. Second, the researchers observed the composition of harvesting and processing groups and the roles performed by each member of the group while participating in these activities with key respondent households and while monitoring the subsistence salmon harvests of 1980 and 1981.

CHAPTER 2

THE NATURAL ENVIRONMENT OF THE TYONEK AREA

GEOGRAPHICAL FEATURES

The dominant geographic feature of the Tyonek area and the region is Cook Inlet, a tidal estuary of the Gulf of Alaska (Fig. 1). The inlet was formed during the Pleistocene epoch by glaciers which have since receded to a fraction of their original size. Extending 200 miles in length, Cook Inlet is 50 miles wide at its mouth and tapers to less than a mile in width at the heads of Turnagain Arm and Knik Arm. Two-thirds of the way north, two points of land called "the forelands" nearly pinch the inlet in two, forming a dividing line between the Upper and Lower Inlet.

Flowing into Cook Inlet are several major rivers and streams which drain approximately 38,000 square miles of the surrounding area. Glaciers occur at the heads of several major rivers and contribute large quantities of glacial silt to inlet waters. Over the centuries deposits of till and silt have built up vast tidal flats at the mouths of the Susitna, Knik, Matanuska, and McArthur river systems. Immediately flanking most of the Upper Inlet are expanses of the relatively flat Kenai Lowlands, which are composed primarily of aluvial and glacial gravels and silts.

Forming the outer boundaries of the Cook Inlet region on the east and southeast are the Kenai and Chugach mountains, with elevations up to 6,000 feet. On the northeast the Talkeetna Mountains rise 6,000 to 7,000 feet, and on the northern and western sides are the Alaska and

Aleutian ranges, reaching average heights of 6,000 - 9,000 feet, with dominating peaks such as Mt. McKinley (20,320 feet), Mt. Spurr, Mt. Redoubt, and Mt. Iliamna.

CLIMATE

The climate of the Tyonek area is generally one of mild temperatures as compared with interior Alaska, and moderate levels of precipitation (Selkregg 1975). Annual temperatures range from the mid 40s F to upper 60s F during summer months, and near zero F to the mid 40s F in winter. Extreme variations occur for short periods and range from -40 F in winter to the upper 80s F in summer. It is not uncommon during winter months to have sudden, short warming spells brought on by high pressure systems moving inland from the Gulf of Alaska. Annual precipitation averages between 15 and 20 inches. Usually by early December freeze-up of rivers and lakes occurs. By mid-April warm temperatures and longer daylight hours bring break-up of these water bodies at the lower elevations around Tyonek. During most winters, ice forms on upper Cook Inlet, but tidal action maintains this ice in a shattered condition.

PLANT AND ANIMAL COMMUNITIES

Two species of marine mammals, the belukha whale and harbor seal, inhabit the waters of Upper Cook Inlet. Both move into Upper Inlet waters during spring and summer in search of food, and for the birth of calves and pups. They spend winters in the lower reaches of the inlet.

Because of the Upper Inlet's high silt content few marine plants and fish are resident in its waters. Inlet waters are seasonally occupied by anadromous fish. Large numbers of five species of salmon, and eulachon (hooligan, smelt), move along the shoreline to spawning streams. Lesser members of Bering cisco and Pacific tomcod migrate to spawning streams in the fall and winter months (Kevin Delaney, pers. comm., 1984). During spring and summer, rainbow trout and Dolly Varden also move out of local streams and along the inlet in response to changing stream conditions and to follow migratory salmon to feed on their eggs.

The Lower Inlet from Tuxedni Bay south has less silty water than the northern half and is highly productive in marine vegetation, bottomfish, and other fish species. South of the forelands, large concentrations of shellfish, especially clams, are found in sandy beaches (Selkregg 1975). Some species like herring follow clear water conditons north and occasionally become available (Kevin Delaney, pers. comm., 1984). This same activity may also explain the infrequent appearance of halibut, flounder, and sculpin on Tyonek beaches.

Of the salmon species, runs of king (chinook) salmon are the first to pass the beaches near Tyonek, beginning in mid-May and continuing into late June. Red (sockeye) salmon follow the kings in June and run through July. Pink (humpback) and chum (dog) salmon are locally available in July and August. Finally, silver (coho) salmon appear near Tyonek beginning in July and are generally available in local streams through September (Evans et al. 1977).

Relatively little is known about most activities of freshwater fish species in the area (Kevin Delaney, pers. comm., 1984). Rainbow trout

are the most abundant freshwater fish in the area and inhabit most of the streams and many lakes. Concentrations of rainbows occur in the Chuitna River, Nikolai Creek, and the Theodore River. Dolly Varden are mostly seasonally available as they follow the salmon migrations into the river systems and the salmon smolt migrations out. Dollies also move from one river system to another through the inlet as stream conditions change. Several local lakes are inhabited by Dolly Varden year round.

Dominating the land near Tyonek are upland forests of sprucehardwood, one of the five major plant communities in the area (Fig. 2). This vegetation type is characterized by white spruce, birch, and cottonwood trees with an understory of shrubs including alder, high-bush cranberry, blueberry, lowbush cranberry, and labrador tea.

Immediately to the north and 15 miles south of Tyonek, is wet tundra vegetation which grows in low coastal areas, and is dominated by sweetgale, grasses, and cotton sedge. In drier areas are stands of low-bush blueberry and labrador tea. At the higher elevations 15-20 miles west and north of the village are areas of highland brush, typified by dwarf birch and willow shrubs. At even higher mountainous elevations alpine tundra occurs.

Inhabiting the land and freshwater habitats around Tyonek are 38 species of mammals, about 152 species of birds, and approximately 12 species of fish (Environmental Research and Technology, Inc. 1984). Of the Alaskan big game species, moose are the only ungulate which occupies the Tyonek area. They are found in a variety of habitats, of which three types, upland shrub, lowland communities, and transitional riverine communities subject to seasonal flooding and dominated by





willow, are the most important. Although some moose, usually cows with calves, reside in the area year round, most moose migrate between habitat types during different seasons (Faro 1984:10-15). In the spring bulls and barren cows move to higher elevations where they remain through summer and fall. With the first frosts and snowfalls moose move to lower riparian areas where they remain throughout the winter.

Black bear are common throughout the mixed spruce-hardwood areas from the shoreline of Cook Inlet to above timberline. Around Tyonek they are often seen along the shoreline of the inlet, along streams, around bogs, and in clearings. Bears den up during winter months in lower elevation areas and emerge from their dens in early spring. They eat a variety of plant and animal foods including grasses, berries, herbacious plants, roots, insects, salmon, and rodents, and often prey on moose calves.

Also common throughout the area are brown bears, which tend to occupy open habitats and are most frequently found in the open upland shrub and tundra communities. Brown bears feed mainly on plants, but also feed on spawning salmon when they are available, and occasionally on moose. In early spring, brown bear are commonly seen on Tyonek beaches feeding on hooligan which have washed ashore.

Many small mammals are found in the area, occupying different habitat types. In freshwater habitats beaver are found in abundance; muskrat are less common. On the edges of lakes and streams and in upland areas are ermine, least weasel, otter, and mink. Ranging over wider areas in a variety of habitats are lynx, red fox, gray wolf, coyote, and wolverine. Except for red fox and coyote, these latter

species are uncommon. Inhabiting mixed and coniferous forests are marten, porcupine, red squirrel, and flying squirrel. Because of the large number of different bird species inhabiting the area only those important for human use will be discussed. The reader should consult Kessel et al. (1982) and Environmental Research and Technology, Inc. (1984) for detailed discussion of birds in the area. The two most commonly harvested groups of birds are waterfowl and upland game birds. Waterfowl migrations into the area begin in early to mid April with flights of geese and swans moving onto the Susitna and Trading Bay Flats. Birds follow the edge of breakup in the spring, primarily occupying areas of open water. The peak migration occurs in early May. Most geese and ducks move on to western and interior regions of Alaska; however, the flats serve as important nesting ground for dabbling ducks like mallards, pintails, and green-winged teal. Fall migrations take place between late August and November.

Upland game birds include grouse and ptarmigan. Spruce grouse live in mixed coniferous forests and clearings. They are not abundant in the area, and their numbers fluctuate considerably depending upon weather and temperature patterns.

Three species of ptarmigan are found in the Tyonek vicinity. Rock ptarmigan are the most common and inhabit rocky ridges and tundra slopes. During winters they move to lower, open forests and shrublands. White-tailed and willow ptarmigan are less common in the area. While white-tails occupy similar habitat as rock ptarmigan, willow ptarmigan prefer lower elevations in willow shrub thickets and muskeg and often winter in shrub habitats among scattered trees below treeline. Their numbers are very cyclical and are sometimes common in the area.

In summary, the availability of the larger and most abundant wildlife resources in the area is highly seasonal owing to the migratory movements of these species. Species such as salmon, eulachon, marine mammals, and waterfowl migrate through the upper inlet area or remain for brief periods each year. Likewise, moose are most accessible to Tyonek residents at lower coastal wintering areas in the winter after they have migrated from higher elevations.

CHAPTER 3

HISTORICAL AND ETHNOGRAPHIC BACKGROUND

INTRODUCTION

At the time of the first European explorations of Alaska's southern coast in the late 18th century, the Dena'ina (Tanaina) Athapaskan Indians occupied the shores and adjacent inland regions of Cook Inlet north of and including Kachemak Bay (Fig. 3). Dena'ina groups also lived in the Iliamna Lake region and the Mulchatna and Stony River drainages. The area surrounding modern Tyonek lay within the territory of the speakers of the Upper Inlet Dena'ina dialect (Kari:1975,1977). In the 19th century, the Upper Inlet Dena'ina were composed of several regional groups, including the Tubughna ("beach people"), whose territory bordered Cook Inlet from the McArthur River north to the mouth of the Susitna River. This area is known as Tubughnen, "beach land," in the Dena'ina language (Kari and Kari 1982:33). Numerous Dena'ina villages and house sites were located on the bluffs along this stretch of the inlet. Other Upper Inlet regional groups included the Susitnuht'ana ("sand river people"), the Dghelay Teht'ana ("mountain people"), and the K'enaht'ana ("Knik area people") (Fall 1981:23-24).

Each regional group was further subdivided into several villages or, in the case of the <u>Dghelay Teht'ana</u>, local bands. The locations of some of the most important historic Cook Inlet Dena'ina villages are depicted in Fig. 3. Villages contained one or several large multifamily



Figure 3. Dena'ina regional groups and some historic village sites, Cook Inlet region.

houses called <u>nichi</u>. Within each village lived groups of people related to one another through membership in matrilineal clans or through marriage.Each village contained at least one <u>qeshqa</u> ("rich man"), who provided economic and political leadership to his community (Fall 1981:245-248).

In precontact and early historic times, approximately until the late 1890s, differences between the subsistence activities of each regional group of Upper Inlet Dena'ina were conditioned largely by environmental factors. For example, the Tubughna and the people of the lower Susitna River hunted marine mammals such as belukha and harbor seal, while the villages of the Yentna River drainage and the middle Susitna River harvested more land mammals, such as moose and caribou. Almost all of the Upper Inlet Dena'ina, however, probably relied most heavily on salmon, especially kings, reds, and silvers (Fall 1981:152; cf. Osgood 1937:26-27). The Dghelay Teht'ana, who lived in the Talkeetna Mountains, were an exception; they relied heavily on game and were far more nomadic than the other Upper Inlet groups. It is also important to note that all Dena'ina villages were linked through trading networks organized by the qeshqa; food and other raw products were exchanged between villages of each regional group several times each year, especially in early spring and during the winter when local supplies of food sometimes ran low (Fall 1981:196-197).

TRADITIONAL SEASONAL ROUND

By combining information from traditional stories (<u>tsukdu</u>), the accounts of village elders, and written ethnohistorical materials (see

summary in Fall 1981:182-202; cf. Alexan 1965; Kari 1982, for an annotated list of Dena'ina placenames), it is possible to reconstruct the seasonal round of subsistence activities of the <u>Tubughna</u> at the time of contact with Euro-Americans in the late 18th century. Dena'ina elders today stress that subsistence resources around Tyonek were diverse and abundant in the past. The Tyonek area was known as <u>EInen Bunkda</u>, "the mother of the earth" because of the rich marine products available locally. It was contrasted with the Susitna River drainage, called <u>EInen Tukda</u>, "the father of the earth," where large land mammals and furbearers were more readily accessible.

Following winter, which was a period of relatively little activity, a new round of subsistence harvests began for the <u>Tubughna</u> in April, called <u>nut'aq'i n'u</u>, "geese month." Numerous species of migratory waterfowl passed through the Upper Inlet, and the Tyonek people snared or shot them with bows and blunt arrows at local marshes, lakes, and river mouths. They also travelled north to the Susitna Flats to hunt waterfowl and trade with the <u>Susitnuht'ana</u>. In addition, extended family groups operated fish traps (<u>tayin</u>) for trout in small lakes. Beaver were also speared or taken with deadfalls.

In late April, families moved from the winter villages to fish camps along Cook Inlet. Here they took large quantities of hooligan (eulachon) with dip nets and prepared hooligan oil. The <u>Tubughna</u> hunted marine mammals from these camps as well. Harbor seals were taken from kayaks (<u>baydargi</u>) with harpoons or with clubs. Belukha were hunted from beluhka spearing platforms called <u>yuyqul</u>. Each <u>yuyqul</u> was constructed from a single large spruce tree, embedded upside down in the mud flats at low tide and secured with rawhide lines. The hunter stationed

himself in the "nest" formed by the tree's roots. After the tide came in, the hunter harpooned a passing belukha, then signalled to his hunting partners waiting on shore with kayaks. They pursued the animal until it died, then towed it back to camp. Belukha fat was rendered into oil; the meat was dried and stored for winter (Pete 1980).

Also, the <u>Tubughna</u> obtained razor clams in the spring, either by travelling south to Redoubt Bay or Tuxedni Bay, or through trade with the Qezdeghdna of lower Cook Inlet.

Although the variety of resources available to the <u>Tubughna</u> in spring was great, the resource harvested in the greatest abundance was salmon, which passed by the Tyonek area beginning in late May and June, called <u>*Iiq'aka'a n'u*</u>, "king salmon month." Kings and sockeye were taken with dipnets from platforms constructed of poles (<u>tanik'edi</u>) which extended directly into the inlet above the tidal flats. The harvesting, processing, and storing of salmon was directed by the <u>qeshqa</u> of each multifamily house or village. Salmon were also taken with basket traps and weirs in small streams and lake outlets. This was especially common for harvesting silver salmon in late August and September during fall hunts. Most of the summer was spent fishing and preparing a large supply of dry salmon for winter use.

Hunting land mammals was also a major subsistence activity of the <u>Tubughna</u>, although their access to big game was more limited than that of other Upper Inlet Indians. Elders report that moose were rare in the Tyonek area until the 1940s. Caribou, sheep, and bear hunting took place in the mountains west of Tyonek near Chakachamna lake. Bear hunting and fall fishing also occurred in the Hiline Lake-Beluga Mountain area north of the villages. Also, groups of Tubughna crossed the
Hayes River Pass, called <u>Tubughna Katidi/tuni</u>, "Beach People's trail extends down," to hunt caribou and sheep, and to trade with the Yentna River Dena'ina. During their return to the winter villages, the hunters cached meat along their trails for use during winter hunting trips. The products of the hunts were given to the <u>geshga</u>, who distributed food and raw materials to his followers throughout the winter months.

Early winter, from November to January, was a restful period spent mainly at the winter villages. Visiting other communities, trading, storytelling, and potlatching also occurred. During this period of the year, hunting partners made short trips of one to several days for moose, bear, and small game such as ptarmigan, hare, and porcupine to supplement the diet of dried meat, fish, and oil. Fresh fish, mostly trout, were obtained through the ice from local lakes. Furbearers, such as marten, were also taken in winter for raw materials, potlatches, and trade. If food supplies ran low in late winter, January to March, village groups sometimes dispersed to lakes in new hunting and fishing areas. Specially trained dogs were used to seek out brown and black bear dens. In April, with the anticipated return of waterfowl, eulachon, marine mammals, and salmon, the sparse season ended and the annual cycle began anew.

HISTORY OF THE UPPER COOK INLET AREA AND HISTORICAL CHANGES TO THE SEASONAL ROUND OF SUBSISTENCE ACTIVITIES AT TYONEK

The effects of the Euro-American fur trade and later changes in the economy of Alaska and the Cook Inlet area on Dena'ina culture and society have been discussed by Osgood (1937:190-194), Townsend (1965, 1970, 1981), and Fall (1981). Although this report will not describe

the development of these changes in detail, it is necessary to review the major changes and historical events in order to understand contemporary resource use in Tyonek and to compare them with the patterns of the past.

The first recorded encounter between Europeans and the native people of upper Cook Inlet occurred in May 1778, when the English Captain James Cook traded glass beads, scraps of iron, and old clothes for hare, sea otter, and marten furs at Trading Bay near North Foreland with a large group of natives who were probably Dena'ina (Cook 1967 [original 1776-80]:363-4; de Laguna 1934:14-15). When Captain George Vancouver explored Cook Inlet for the English in 1794, he learned that Russian trading companies had established several outposts along Cook Inlet, including a contingent of 19 men at North Foreland near modern Tyonek (Vancouver 1801:205-207). This may have been the post called "Tuiunak" in Russian sources (Fall 1981:65; cf. Tikhmenev 1978:45-46; Fedorova 1973:121: Bancroft 1886:338). Relations between the Dena'ina living near this station and the Russian traders were poor. Because of their exploitation by the Russians, the Dena'ina destroyed this outpost and killed the entire Russian contingent (Tikhmenev 1978:45-46, 1979:46). The people of Tyonek today maintain a vivid oral tradition about this event (e.g. Alexan 1981; Fall 1981:67-69).

In the early 19th century, trading relationships between the Cook Inlet Dena'ina and the newly formed Russian American Company were established. The major Russian trading outpost was at Fort St. Nicholas on the Kenai Peninsula, modern-day Kenai. The Tyonek Indians acted as middlemen in the fur trade between the Russians and the more inland

Dena'ina villages. The <u>Tubughna</u> also trapped furs themselves in the forests and adjacent mountains near their villages.

The fur trade gradually introduced a new technology of non-local manufacture, such as steel traps, guns, and ammunition, as well as clothing, some foodstuffs, and "luxury" items such as blankets and trade beads. This established a dependence on traders as a source for these items, and the necessity to trap furbearers to obtain these goods. Consequently, trapping effort increased, and it is likely that men were absent from winter villages for longer periods of time than before contact with Europeans. However, this new technology was integrated into Dena'ina life, and involvement in the fur trade for a time enhanced some aspects of traditional Dena'ina social organization, such as the role of the <u>geshqa</u> as middlemen in trade and as organizers of economic production (Fall 1981:277-292).

Certainly more deleterious to the traditional Dena'ina sociocultural system were the tremendous population losses of the 19th and early 20th centuries (Table 2). In the late 1830s about one-half of the Dena'ina population died in a smallpox epidemic. As a consequence, the Dena'ina became more susceptible to agents of sociocultural change. For example, a Russian Orthodox mission was founded at Fort St. Nicholas, and most Dena'ina were converted to Christianity (Fall 1981:69-81).

Population loss also had profound effects on settlement patterns; many winter village sites were abandoned, resulting in more widespread travel in fall and winter to reach traditional hunting areas. Just as important, this population loss, combined with the efforts of Russian

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YEAR	POPULATION
1805	3000 (estimate)
1819	1471
1830	1537
1840	1206
1841	967
1845	816
1849	954
1860	1099
1870	709
1880	1171
1890	817
1899	1170
1910	672
1932	650
1974	900
1982	800

Source: Fall 1981:110-111; Krauss 1982

Orthodox missionaries to introduce cultural changes, placed tremendous strain on the traditional socioeconomic organization centered around matrilineal clans, multifamily dwellings, and the redistribution of subsistence products. By the early part of the 20th century, nuclear family homes were the rule, and the matrilineal organization was replaced by one based on bilateral extended kinship. These changes weakened the position of the qeshqa, the community leaders.

Soon after the American purchase of Alaska in 1867, the Alaska Commercial Company (ACC) acquired the assets of the Russian American Company. The ACC operated a trading post at Tyonek during most of the late 19th century. This post was located near the mouth of Old Tyonek Creek (locally known as "Robert's Creek"), south of the present location of the village. Most <u>Tubughna</u> began wintering near the post, abandoning other village sites (Fall 1981:406).

In the 1880s, a commercial salmon fishery was developed in Cook Inlet by business interests from outside the territory. The first Cook Inlet cannery was constructed at Kasilof on the Kenai Peninsula in 1882. Cannery ships made regular visits to Tyonek to fish and to purchase the natives' salmon catch. By 1896 a salmon saltery was operating at the mouth of the Chuitna River. According to contemporary observers (e.g. Bortnovsky 1974; Elliot 1900:741; cf. Greuning 1968:97; Fall 1981:92-93), non-native commercial fishing in Cook Inlet in the 1890s led to depletion of local salmon stocks and expropriation of Indian fishing sites.

Non-native permanent settlement in the Upper Inlet area was sparce until the 1890s, when discoveries of gold along Turnagain Arm and in the Susitna Basin resulted in several waves of prospectors and miners

passing through and in some cases settling in the region. Tyonek became a major disembarking point for supplies and people. For example, in May 1898, 300 prospectors were camped on the beach at Tyonek waiting for the ice on the Susitna River to go out (Potter 1967:15,33). Indians and prospectors sometimes competed for dwindling supplies of fish and game (W. Osgood 1901:56; Fall 1981:141,151). Also, Indians were hired as guides, packers, and letter carriers. Marriages between the newcomers and Indian women also took place (Fall 1981:97). Another important effect of these prospecting activities was the founding of permanent settlements along Turnagain Arm and at Knik. Knik, because of its proximity to mining activities, soon replaced Tyonek as the major supply and transportation center of the Upper Inlet (Fall 1981:98).

By the first decade of the 20th century most of the Upper Inlet Dena'ina population had consolidated to a few settlements centered around trading posts and missions, such as Tyonek, Susitna Station, Knik, and Eklutna. From these bases, they continued to follow a modified seasonal round that included summer subsistence fishing at fish camps, and winter hunting and trapping, sometimes at great distances from the villages. Seasonal wage employment, when available, was becoming integrated into this pattern.

After the turn of the century, rapid economic change occurred primarily along the eastern and northern shores of Cook Inlet. Construction of the Alaska Railroad in the 1910s and 1920s was an impetus for the growth of an Upper Inlet economy eventually centered at Anchorage based on transportation, trade, mineral extraction, and agriculture. Regional population growth was stimulated by the federally subsidized colonization of the Matanuska Valley for agriculture in the

1930s and the construction of military facilities in the Anchorage area during World War II. Oil and gas development on the Kenai Peninsula and in Cook Inlet in the 1950s encouraged further growth of Anchorage as the state's major city and the rapid population growth on the Kenai Peninsula. The population of Anchorage and the Cook Inlet region grew from 39,910 in 1950 to 217,529 in 1980 (Table 3), an increase of 445 percent.

Due to its relative isolation, the west side of Cook Inlet and the village of Tyonek remained peripheral to this regional growth, but not unaffected. By the early 1900s, the village had moved from its location at Robert's Creek ("Old Tyonek Creek") to a site near the mouth of Tyonek Creek. In 1915, an Executive Order created the Moquawkie Indian Reserve of 26,918 acres surrounding Tyonek. In 1918, the devastating "Swine Flu" influenza pandemic claimed the lives of a large proportion of Upper Inlet Dena'ina. This event eventually led to the abandonment of most remaining Indian villages in the Susitna Valley and western Cook Inlet. Most survivors relocated in Tyonek. In the early 1930s, because of flooding problems the village was again moved, this time to its present location at Qaggeyshlat near the Chuitna River, the site of a former Dena'ina village. The population of the community grew in 1934 when most of the last residents of the village of Susitna Station moved to Tyonek. A village council was established in Tyonek under the provisions of the Indian Reorganization Act (IRA) in the late 1930s. It remains the village governing body. Also dating from the 1930s is the establishment of commercial fishing as an important source of cash for Tyonek residents.

TABLE 3. POPULATION OF THE COOK INLET REGION 1880-1980

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		%	
YEAR	POPULATION	INCREASE	CENSUS DISTRICTS INCLUDED
1880	925		Kenai Peninsula, Cook Inlet
1890	1,130	22%	English Bay, Kassilof, Kenai, Kinik, Kustatan, Ninilchik, Seldovia, Sushitna, Toyonok
1900 ¹	835	-26%	Kasilof, Kenai, Seldovia, Sunrise, Tyonek
1910	2,369	184%	Cook Inlet, Kenai
1920	5,037	113%	Cook Inlet, Kenai, Knik
1930	6,009	19%	Anchorage, Kenai, Palmer, Seldovia, Seward, Talkeetna, Wasilla
1940	9,585	60%	Anchorage, Homer, Palmer, Seldovia, Seward, Talkeetna, Wasilla
1950	39,910	316%	Anchorage, Homer, Palmer, Seldovia, Seward, Talkeetna, Wasilla
1960	97,074	143%	Election Districts 9, 10, 11, 12
1970	149,480	54%	Anchorage, Kenai-Cook Inlet, Matanuska-Susitna, Seward
1980	217,529	46%	Anchorage, Kenai Peninsula Borough, Matanuska-Susitna Borough

Because several known communities were evidently not counted, the regional total for 1900 is highly suspect.

Source: Rollins 1978; U.S. Bureau of the Census 1980

Referring to the early 1930s, the anthropologist Cornelius Osgood (1937:191) wrote of Tyonek:

Across the inlet at Tyonek, the Indians have a cooperative village which appears to be one of the most hopeful developments to be seen among the Northern Athapaskans. A community of feeling which is of the greatest importance to their well-being has been fostered by the government agents in charge of the school...The Indians, owning a large trap of their own, contract to fish for the canning companies during the salmon season and with the proceeds manage to supply themselves through their cooperative store, leaving a considerable excess in cash earnings. The active men gather regularly in council to discuss the problems of the community and this in itself aids group morale. Although the aboriginal material culture has disappeared as elsewhere, some attempt has been made to adapt the social culture to modern conditions.

However, most Tyonek residents today describe the 1930s, 1940s, and 1950s as a period of poverty and hardship, caused by poor commercial fishing, low fur prices, and generally scarce subsistence resources (cf. Braund and Behnke 1980:181).

Evidently, the cooperative commercial fishing effort described by Osgood did not survive into the 1940s, by which time Tyonek families had established individual commercial fish camps along the inlet. With depressed fish stocks, especially in the 1950s (Braund and Behnke 1980:181,206) commercial and subsistence fishing suffered. In 1933 Osgood (1937:191) had noted that "the Tanaina still depend primarily on fish for food, and secondarily on mammals. To these are added periodic supplies of foreign articles purchased from stores." The same conditions prevailed in the village in the 1950s.

The economic fortunes of the village underwent a dramatic reversal in the early 1960s when Tyonek was awarded almost \$13 million for natural gas leases on the reserve. This money enabled the village to

build 60 new homes and a new school, and to install and maintain a village water and sewage system, as well as provide electricity to village residents for the first time. However, little marketable gas was discovered on reserve lands, and prospects for wage employment opportunities did not develop. The village elected to participate in the Alaska Native Claims Settlement Act (1972) and the former reserve lands became the property of the Tyonek Native Corporation (TNC), with 303 people enrolled in 1974. Other village properties continued to be controlled by the village council.

Although the gas lease sale and ANCSA enabled the residents of Tyonek to more fully participate in the state's rapidly expanding economy, fish and game harvests for local use remained critical to the village's well being throughout the 1960s and 1970s. Participation in hunting and fishing activities remained high. However, competition with increasing sport and commercial uses at times led to resource shortages in the village (Braund and Behnke 1980:181). A major dilemma was the major reduction in Cook Inlet king salmon stocks caused by overharvests by the commercial fishery in the 1950s and 1960s, and the subsequent closure of all fishing on these stocks, including subsistence, in 1964 by the Alaska Board of Fisheries. The closure placed severe hardships on many Tyonek families and temporarily interrupted the transmission of traditional fishing and processing skills to the young. Some households continued to fish for kings despite the closure (Stickney 1980:8). By the mid 1970s, the king salmon stocks had recovered adequately enough for the board to reinstitute a recreational king salmon fishery in certain Susitna River tributaries. Commercial fishing on these stocks remained closed. In 1980 the board declined to reopen the subsistence

fishery at Tyonek. However, a ruling of the Anchorage Superior Court in 1980 reversed this decision. The restoration of the legal subsistence fishery resulted in a reinvigoration of traditions surrounding salmon fishing in Tyonek.

In 1983, the village formed a fish and game advisory committee to participate actively in the state's fish and game management process. Through the efforts of committee members and other residents of the western Cook Inlet region, the Board of Game in 1983 and 1984 amended moose hunting regulations to provide a winter season in GMU 16B which brought them more into conformity with traditional patterns. Moose hunting had been restricted to September since 1975 due to growing hunting pressure from urban portions of the region. These examples illustrate the efforts of the village to maintain the opportunities to fish and hunt that have supported the village since before the arrival of Captain Cook and the Russian fur traders in the late 18th century.

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CHAPTER 4

COMMUNITY SOCIOECONOMIC CHARACTERISTICS

POPULATION

The community of Tyonek (Fig. 4) in 1983 consisted of approximately 90 dwelling units in two distinct groups. Houses in "the village," located on a bluff directly above Cook Inlet, were constructed in the mid 1960s. They replaced the log homes built at this site in the early 1930s when the population moved from the former village site at Tyonek Creek. The 27 homes in "the subdivision" were completed in 1980. This new subdivision is located approximately one-third mile from "the village" and is reached along an unpaved road.

Census data for Tyonek for the period 1900 to 1984 are presented in Figure 5. The population has grown steadily since reaching a low of 58 people in 1920, two years after a large percentage of the village perished in an influenza epidemic. Recent population estimates for Tyonek vary according to different sources. Braund and Behnke (1980:198) reported a village population of 270 people in 1978. In 1980, the Bureau of the Census counted 239 people. In the resource use survey conducted by the Division of Subsistence in February 1984, 80 village households were identified; all were interviewed. The village population was 273 people. Age and sex characteristics of Tyonek residents in 1984 (Fig. 6) indicated that three-forths of the population was under 35 years of age. Within this group equal proportions were male and female; however, there were twice as many females as males between zero and fifteen years of age. The opposite was true for the



Figure 4. The community of Tyonek, 1983.





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Figure 6. Population profile by age and sex, Tyonek, February 1984.

20-34 year age group where there were nearly twice as many males as females.

Of the 80 households at Tyonek in early 1984, eight were composed of teachers, social workers, and their families. All of these households were short term residents, and most were non-Native. Members of the remaining 72 households were primarily long term or life-long Tyonek residents (cf. Stickney 1980:3). Over 95 percent of the village's population was Alaska Native, mostly Dena'ina Athapaskan (cf. Darbyshire 1981). Multiple kinship ties linked almost all of these households together. The Dena'ina population in the village contained the descendents of three former regional groups: the <u>Susitnuht'ana</u> (Susitna River), <u>Tubughna</u> (Tyonek), and <u>Qezdeghdna</u> (Kustatan). About ten village elders were born in former Susitna River villages and a few others grew up in Kustatan. There were also kinship relationships with the Dena'ina of the Kenai Peninsula, Eklutna-Knik, and Nondalton.

COMMUNITY SERVICES AND FACILITIES

During the study period, Tyonek was an unincorporated community within the Kenai Peninsula Borough. The borough had the responsibility for providing educational services for the village, and operated a school with 90 students in 1984 in grades K through 12. As mentioned in Chapter 3, a nine member IRA council has been recognized by the federal government as the official tribal governing body of the village. The council in association with the Cook Inlet Native Association (CINA) administered federal programs in local health care, employment assistance, social services, and tribal operations. The council also

managed village investments in properties acquired following the gas lease sales of the mid 1960s. Employed by the council in 1981 were a president, village administrator, clerk, shop mechanic, expeditor, and part-time maintenance person (Darbyshire 1981).

The village operated and maintained a water treatment plant, and all homes were equipped with running water and electricity. Homes were heated by electricity, supplemented by wood-burning stoves. The village also maintained a mile-long gravel airstrip. There was scheduled, daily service to Anchorage from three taxi operators. In 1984, a round trip ticket cost \$45. This low fare was supported by the high volume of business generated by oil and gas exploration and production along western Cook Inlet, coal exploration, and the operation of a power plant at Beluga, eight miles to the northeast of Tyonek. A network of gravel roads, products of timber harvesting and oil and gas development and exploration, radiated south from the village to the Chakachatna River. Although no bridge crossed the Chuitna River to the north, a road system also existed in the Beluga area. This road network was not connected with Alaska's highway system. However, in winter an ice bridge was sometimes constructed across the Susitna River and villagers were able to drive to Wasilla in about three hours and to Anchorage in approximately four hours.

Village health care was provided by a full-time community health aid and a part-time community health representative who worked in a clinic maintained by CINA funds. Periodically, doctors and nurses from the Alaska Native Service Hospital (ANS) in Anchorage visited the village. Commonly, villagers travelled to Anchorage for all but minor health care needs (Darbyshire 1981). CINA provided funds to employ three

village firemen. There was an officer of the Alaska State Troopers stationed at Beluga.

Community facilities included a snack bar, guest house, day care center, village community center-office, and post office. Village elders and the village dance team practiced traditional songs at the guest house. The annual village potlatch was held at the school. A new, larger village center, equipped with offices, kitchen facilities, and a large hall was under construction in August 1984.

Most villagers born before 1972 belonged to the Tyonek Native Corporation (TNC) established by the Alaska Native Claims Settlement Act (ANCSA) in 1971. In July 1981, TNC had 270 shareholders. Most lived in the village, but a substantial number resided in Anchorage, where the corporation's offices were located. Under the provisions of ANCSA, TNC was entitled to 112,500 acres of land, including the 26,918 acre former reserve. Other major landowners in the Tyonek area included the Cook Inlet Region Inc. (CIRI), the regional ANCSA profit corporation; the Kenai Peninsula Borough; and the State of Alaska. The U.S. Federal Government owned or managed no lands near the village.

A small privately owned store provided staples, canned foods, and frozen meats. A few households shopped there exclusively but prices were about 38 percent higher than those in Anchorage in February 1984 (Table 4, Appendix C), and important items were often unavailable. Many households took advantage of the daily scheduled commercial flights between Tyonek and Anchorage to purchase large supplies of groceries. Some commercial fishermen use their fishing boats to transport supplies from Anchorage and Kenai to Tyonek. The village or groups of residents periodically hired a barge to ship supplies from Anchorage to Tyonek.

Transportation costs per barge load were \$3,000 in 1981 (Darbyshire 1981).

		Price of	Percent below	
store	date	66 items	Tyonek	
Tyonek	1984	\$167.06		
Anchorage A	1984	101.51	39%	
Anchorage B	1984	103.83	38%	

TABLE 4. COMPARISON OF FOOD PRICES, ANCHORAGE AND TYONEK, 1984

COMMERCIAL SECTOR AND WAGE EMPLOYMENT

During the study period, most remunerative employment in Tyonek was highly seasonal. Income was earned in commercial fishing, heavy equipment operation, village administration and other governmentsponsored programs, the school, post office, the store, and a few jobs associated with mineral exploration and development.

Commercial fishing for salmon was a major source of cash income for Tyonek residents during the study period. Tyonek residents held 27 limited entry set net permits in 1984. In 1983, 28 Tyonek households (39 percent) derived cash income from commercial fishing (Fig. 7). Most of these households engaged in commercial fishing for one or two months.

Cash earnings from commercial fishing in Tyonek have been low relative to the Cook Inlet commercial fishing in general. The Tyonek fishery has remained marginal because of limited fishing time, the relative inefficiency of set nets compared with the drift net and purse seine fleets of the lower Cook Inlet, and the lack of a local buyer (Braund and Behnke 1980:206). Gross annual earning for Tyonek commer-



Figure 7. Months of cash income from commercial fishing and welfare payments, Tyonek, 1983.

cial fishermen from 1974 to 1979 averaged \$9000 (Stickney 1980:7). In 1981, the median gross income from commercial fishing was in the \$10,000-19,999 range (Table 5).

In 1982, Tyonek fishermen reported gross earnings of \$109,319, for an average of \$4,753 per permit holder (Table 6). In contrast, Kenai Peninsula Borough fishermen reported an average gross income of \$26,755 per permit. Tyonek residents reported that 1983 was the poorest commercial fishing year, with most fishermen having no net income.

Commercial fishing was sole income source for very few Tyonek households during the study period. Of the 72 village households not containing short term resident-government employees in 1983, 6 (8 percent) derived earned income only from commercial set netting. An additional 23 households (32 percent) derived income from commercial fishing and wage employment, while 30 households (42 percent) received income only from wage employment. Thirteen households (18 percent) had no earned income, with members retired or unemployed in 1983 (Fig. 8).

Government programs supported the majority of the wage employment positions in Tyonek during the study period. In the spring of 1979, for example, of the 54 people employed full or part-time in the village, 38 (70 percent) had jobs related to government programs. In addition, eight villagers worked at the Tyonek Timber Company, four worked for an oil company drilling exploratory wells on village lands, and four worked in Anchorage on prefabricated homes for the village subdivision (Braund and Behnke 1980:206). In mid 1981, permanent positions in the village included teachers and school support staff (20), village administrator (6), store retailers (2), constable (1), community health aides (2), post office (1), air taxi operator (1), day care employees (2), and fire

TABLE 5. INCOME RANGES FROM COMMERCIAL FISHING FOR SALMON TYONEK 1981

Percent earning less than \$1,000		*	
11	11	1,000 - 9,999	33.3
"	11	\$10,000 - 19,999	33.3
11	"	\$20,000 - 29,999	33.3
11	**	\$30,000 - 49,999	*
11	11	\$50,000 - 74,999	0.0
**	**	\$75,000 - 99,999	0.0
"	11	greater than \$100,000	0.0
			99.9

* Less than four: due to confidentiality regulations number cannot be disclosed.

Source: Alaska Department of Fish and Game 1981

TABLE 6.COMMERCIAL FISHING INCOME, TYONEK AND THE KENAI
PENINSULA BOROUGH, 1982

	Number of permits fished	Total Pounds	Total gross earnings	Gross earnings per permit
TYONEK	23	149,537	\$109,319	\$4,753
KENAI PEN. BOROUGH	2,031	87,541,405	\$54,339,312	\$26,755

¹ Includes Tyonek totals

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Sources: Alaska Department of Fish and Game 1982



Figure 8. Percentage of Tyonek households by type of income activity, 1983.

control (4). In addition, 19 people were employed as supervisors and laborers through CETA funds.

As illustrated in Figure 9, in 23 percent of Tyonek households, members in total held full-time wage employment for 12 months or more in 1983. Another 44 percent had household members employed for a total of 1 to 11 months. Thirty-three percent had no full-time employment in 1983. Only 17 households (24 percent) had members with part time employment in 1983; most of this was for four months or less.

Although wage positions were available during the study period at the Tyonek Timber Company (Kodiak Lumber Mill) wood chip plant and the Chugach Electric Power plant at Beluga, few Tyonek residents obtained employment at either. This was due in part to lack of required skills and conflicts over poor attendance records, attributable in part to seasonal hunting and fishing activities (Braund and Behnke 1980:207-8). The chip mill closed in 1982. Five Tyonek residents obtained seasonal jobs associated with coal exploration and the construction of a natural gas pipeline from 1981 to 1984. Most residents of Tyonek were reluctant to search for jobs outside the village (cf. Braund and Behnke 1980:205).

Some households in Tyonek derived cash income from transfer payments from several village, TNC, CIRI, and government programs (Figure 7). According to division survey results, about 11 percent of the households received transfer payments for at least one month in 1983.

As a consequence of low commercial fishing earnings and scarce wage employment opportunities, household monetary incomes in Tyonek were below state averages throughout the study period. For example, in 1979 annual household income in the village ranged from less than \$5,000 to



Figure 9. Months of cash income from full time and part time employment, Tyonek, 1983.

\$35,000. Almost half the households earned less than \$10,000 that year (Fig. 10). The mean monetary income for 1980 for a sample of 51 Tyonek households surveyed in 1981 was \$13,441, about 30 percent below the state's average of \$19,200 for that year. Twenty-seven households (53 percent) reported cash incomes below \$10,000 (Darbyshire 1981:15).

In summary, during the study period, most households were involved in local seasonal wage employment, alone or in combination with restricted commercial salmon fishing. Full-time, year-round employment opportunities were scarce, and the wage sector of the community's economy relied heavily on government programs. Consequently, household monetary incomes were relatively low in comparison with state averages.





CHAPTER 5

AN OVERVIEW OF CONTEMPORARY RESOURCE USES

The chapter provides a broad overview of wild resource uses in Tyonek for the period 1978-1984. It summarizes data on species used, levels of household participation in resource harvesting, geographical areas used, seasonal round of resource harvests, the composition of harvest and processing groups, resource sharing networks, and harvest quantities. Most information on levels of participation and harvest quantities is specific to the 12 month period covered by the household survey, February 1983 through January 1984. The chapter concludes with case examples of the seasonal activities of several Tyonek households in 1982. The reader should consult Chapter 6 for more detailed descriptions of harvest techniques, use areas, and resource distribution networks for resources currently used in the village.

Because survey results and the research revealed significant differences in resource use patterns of long-term resident households in the community and the eight households composed of teachers and other government workers temporarily living in the village, the following general summary pertains to the 72 surveyed households who could be considered permanent village residents in February 1984. The final section of the chapter describes the resource uses of the more temporary residents of the village.

SEASONAL ROUND

Resources harvested by Tyonek residents during the study period are listed by resource category in Table 7. An additional list of resources harvested currently and in the past by Tyonek area residents is provided in Appendix C.

During 1978 to 1984, the hunting, fishing, and gathering activities of Tyonek residents followed a regular seasonal round determined primarily by resource presence, environmental conditions, and hunting and fishing regulations (Fig. 11).

The start of a new seasonal round of resource harvest activities was marked by the conclusion of the observation of Lent in April or early May. During the seven weeks of Lent, it is customary for many households in the village to refrain from resource harvest activities. These households abstained from consuming red meat during Lent, following proscriptions of the Russian Orthodox Church. Because of this, stores of smoked, canned, and frozen salmon and clams were consumed and largely depleted by the beginning of spring.

After Lent, and during years of high populations, the hunting of small game species such as ptarmigan, spruce grouse, and hares resumed in April and May. A few households trapped beaver in nearby streams and lakes. As soon as Cook Inlet cleared of flow ice, groups of Tyonek residents organized by "clamming leaders" travelled south in dories to Redoubt Bay and Harriet Point to dig clams. This usually occurred during the first series of very low or minus tides in mid April and continued during the minus tides of May and June.

TABLE 7. WILD RESOURCES USED BY TYONEK RESIDENTS, 1978-1984

Big Game Mammals

Moose Black bear

Marine Mammals

Belukha Harbor seal

Furbearers

Mink Weasel (ermine) Marten Land otter Red fox Beaver

Small Game

Porcupine Snowshoe hare Ptarmigan Spruce grouse

Waterfow1

Mallard Pintail American widgeon Common goldeneye Canada goose

Salmon

King salmon (chinook) Red salmon (sockeye) Pink salmon (humpback) Chum salmon (dog) Silver salmon (coho) Hooligan (Eulachon)

Other Fish

Dolly Varden Grayling Rainbow trout Tomcod Whitefish

Shellfish

Pacific razor clam Cockle Alaskan surf clam

<u>Plants</u>

High-bush cranberry Low-bush cranberry High-bush blueberry Low-bush blueberry Salmonberry Crowberry Rosehips White spruce Paper birch Cottonwood Alder Shelf fungus Wild celery Labrador tea Other medicinal plants

Coal



Figure 11. Seasonal round of resource harvest activities, Tyonek, 1978-1984.

Spring was also the season when other marine oriented activities took place, such as harvesting hooligan and hunting harbor seals and belukha. The beaches near Tyonek and along Beshta Bay were used for placing hooligan nets, or for collecting hooligan by the bucketful after they had been beached by strong surfs created by high winds and storms. Harbor seal and belukha were hunted during trips by dory to river mouths near the Susitna River and Trading Bay where these animals congregate while feeding on hooligan and salmon. Also, seal and belukha were taken while people were subsistence set netting for salmon.

Before the subsistence and commercial fishing seasons each spring, the owners of fishcamps along Beshta Bay south of Tyonek, as well as other fishermen, repaired their boats, motors, and nets and ordered needed supplies, usually from Anchorage. Many households gathered wood for immediate and later use at the camps, and a few gathered coal for heating fishcamp cabins or for smoking fish. At their camps, some people planted small gardens of strawberries, potatoes, turnips, carrots, and other vegetable crops. At the end of the school year in May, about ten families usually moved from their permanent winter residences in the village to their fishcamps. In the past most families resided in the camps beginning in mid-spring and remained there through much of the summer. In the study period, except for these ten families, most people used their camps on a more intermittent basis, usually driving daily or on weekends between the camps and the village. This pattern was due to gravel roads connecting the village with fishing sites, and greatly shortened weekly commercial and subsistence fishing periods.

The major spring harvest activity in Tyonek as measured by levels of household participation and harvest size was subsistence set netting for king salmon. As established by Department of Fish and Game regulations, the subsistence king salmon season began in mid May and continued to mid-June. In these spring months nearly the entire village (82 percent of the households in 1983) was involved in catching and processing king salmon. Sockeye salmon were incidentally caught while fishing for kings.

Commercial fishing usually was opened in the Tyonek area around June 25, after king salmon had passed and concentrated on runs of red, pink, and chum salmon throughout the summer. Almost all of the catch was sold, but occassionally some fish were kept for home use or shared with other families. In recent years, there have been two, twelve-hour commercial fishing periods each week. During August and September runs of silver salmon were harvested for subsistence use. Silvers were taken with set nets on the beaches and with rod and reel in local streams. They were added to winter fish supplies. Freshwater fish species such as Dolly Varden and rainbow trout were harvested in nearby streams with rods and reels throughout the summer and fall. Spring and summer were the most active seasons because of subsistence and commercial fishing, and most people were busy catching and preserving salmon for home use by smoking, canning, or salting.

Between subsistence and commercial fishing periods several groups of people hunted belukha whales. Usually trips were made north to the mouths of the Beluga and Susitna rivers.

A number of additional wild food species were harvested in summer. In particular, berries became very important beginning in August. Those species of berries commonly harvested included high-bush and low-bush cranberries, salmonberries, blueberries, and crowberries. A few households harvested wild celery and wild rhubarb while the young shoots were still tender in late spring and early summer. In late summer rosehips were harvested.

During the first part of September another major subsistence activity commenced, hunting moose. Moose hunting usually involved around two-thirds of the village households. Hunters formed groups which traveled south by boat along the inlet to hunt up the McArthur and Middle rivers. Or, hunting parties used trucks to hunt along old logging and oil and gas roads around Tyonek and to the south near the Chakachatna River. While on hunting trips, family groups also gathered berries, hunted spruce grouse, and fished for silver salmon and rainbow trout. Occasionally, porcupine and beaver were also taken for food during moose hunting trips.

Black bear were occasionally taken incidental to moose. The preferred black bear were those which had been feeding on berries away from salmon streams and the local dump. Additionally, harbor seal and belukha were sometimes incidentally harvested while hunters were travelling to moose hunting areas through Trading Bay and in Redoubt Bay. Waterfowl hunting took place at this time on the flats in Trading and Redoubt bays, and near the Theodore and Lewis rivers.

Some moose hunters waited until after the leaves had fallen from the alder, birch, and willow trees in late September to hunt because the animals were much easier to locate. Also, because moose start to rut at

that time, they were more readily attracted with calls. Other people found the meat of bull moose to taste strong in late September during the rut, and therefore put their effort into earlier or later hunts.

Berry picking continued until the last fruit had withered and fallen in late September. By October wood gathering was common among most households as supplies needed replenishing. During wood collecting trips, spruce grouse were taken when encountered. Shelf fungi found growing on birch trees were collected by many households, burnt into a powder, and used as an ingredient for making snuff. As freeze-up and the first snowfall drew near, fishing gear, boats, and motors were stored, and fishcamps were closed for winter.

In mid November a few trappers set out lines for marten, mink, red fox, and weasel. Traditionally, moose hunting continued throughout the fall and early winter as moose populations moved from high ground west of the village toward the coast. In 1983 for the first time since 1975, a late fall moose hunt was held in Unit 16B, including the Tyonek area, from November 1-15. However, moose had not yet moved to areas accessible to Tyonek hunters, and although Tyonek residents hunted extensively, only one moose was harvested. Consequently, after the Tyonek Village Council petitioned the Alaska Board of Game, another season was held in January 1984 by emergency order. Eighteen moose were taken during this hunt.

After good snowfalls in winter, a few trappers ran trap lines with snowmachines. Without snow, only those people using trucks to check traps near the road system tended their lines. Trapping continued during seasons set by regulations into February and March for beaver. Small game species hunted in winter included ptarmigan during years of

deep snow at higher elevations, and snowshoe hare when their populations were high. Hare populations were extremely low during the study period and consequently there was little hunting effort.

When the ice on lakes and streams was adequately thick, several households fished with hook and line through the ice for Dolly Varden and rainbow trout, reaching the fishing locations by snowmachine or by truck. Occasionally in October or later tomcod were harvested by a few households near the mouths of the Chuitna River and Robert's Creek. Also, as winter days grew longer during February and March large quantities of wood were gathered to last into spring and summer. Much of the winter was devoted to Russian Orthodox holiday activities. The seasonal round completed its cycle with the observance of Lent and Easter in March, April, and early May.

It must be noted that small variations occurred from year to year in the timing of harvests of most resources. Several environmental and man-made factors shaped the general availability of fish and game. Environmental factors included weather conditions, timing of resource presence (e.g. salmon runs, movements of moose) and, for some resources such as clams, fluctuations in tidal periodicity and height.

Examples of man-made factors affecting seasonal rounds include changing hunting and fishing regulations. King salmon fishing was closed from 1964 to 1980; the November moose season reopened in 1983 for the first time since 1975. Forms of transportation helped shape the annual round, in that the development of a local road network encouraged hunting in September when pick-up trucks could be used. Prevailing socioeconomic conditions sometimes intensified harvest efforts; as a consequence of the poor 1983 commercial fishing season, moose hunting
effort reportedly increased. Finally, each household's conformance with the village annual round was shaped by such factors as age, health, wage employment, available equipment, and other individual and household characteristics.

HOUSEHOLD PARTICIPATION

Harvest levels and degrees of household participation in the harvest of fish, game, and plant resources during February 1983 through January 1984 were measured in a survey of 100 percent of Tyonek households in February 1984 (Table 8). As depicted in Figure 12, resource categories which Tyonek households most commonly attempted to harvest included salmon (82 percent), moose (67 percent), plants (64 percent), and wood (60 percent). Factors influencing these rates of participation are discussed by resource category in Chapter 6. Also, it should be noted that many households received resources that they themselves did not harvest (Table 8).

RESOURCE USE AREAS

Figure 13 depicts the total area used by Tyonek residents for hunting, fishing, and gathering resources during the period 1978-1984 (see Chapter 2 for mapping methodology). The resource use area of Tyonek was approximately 750 square miles, and stretched from the Chuitna River on the north to the McArthur River to the south, as well as a 135 mile stretch of tidal flats and coastal areas along western Cook Inlet from the mouth of the Susitna River south to Tuxedni Bay.

TABLE 8.LEVELS OF HOUSEHOLD HARVEST AND USE OF FISH, GAME,
AND PLANT RESOURCES, TYONEK, FEBRUARY 1983-JANUARY 1984 n=72

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	z	z	*		MEAN	TOTAL VILLAGE
	ATTEMPTED	SUCCESSFUL	GAVE	7	HOUSEHOLD	HARVEST .
RESOURCE	HARVEST	HARVEST	AWAY	RECEIVED	HARVEST, LBS	NUMBERS 1
King salmon	81	78	21	21	652.0	2606
Red salmon	61	54	1	4	13.0	226
Silver salmon	46	43	1	6	27.0	319
Pink salmon	10	1	0	0	.4	15
Chum salmon	13	4	0	0	2.2	26
Rainbow trout	13	13	4	1	4.0	194
Dolly Varden	11	11	1	4	2.3	169
Grayling,	1	1	0	0	.1	1
Tom cod	NA	NA	NA	NA	NA	NA
Whitefish	1	1	0	1	.1	6
Hooligan(5 gal bk	s) 26	25	7	25	8.8	21
Belukha	11	4	7	35	9.7	1
Seal 2	7	0	0	0	0	0
Clams ² (5 gal bks) 18	15	15	36	16.3	78
Moose	69	35	28	67	208.3	30
Black bear	1	0	1	0	0	0
Spruce grouse	26	24	6	1	.5	79
Ptarmigan	10	7	1	3	.1	19
Duck	47	36	8	10	4.5	216
Geese	44	7	3	0	.4	9
Hare	0	0	0	1	0	0
Porcupine	17	14	4	7	.9	14
Red squirrel	0	0	0	0	0	0
Flying squirrel	0	0	0	0	0	0
Marten	0	0	0	0	0	0
Red fox	1	1	0	0	0	2
Coyote	0	0	0	0	0	0
Wolf	0	0	0	0	0	0
Mink	0	0	0	0	0	0
Weasel	0	0	0	0	0	0
Beaver	8	7	3	7	3.2	26
Lynx	0	0	0	0	0	0
Otter	0	0	0	0	0	0
Muskrat	0	0	0	0	0	0
Wolverine	0	0	0	0	0	0
Plants (quarts)	64	64	18	4	12.0	865
Medicinal plants	NA	NA	NA	NA	NA	NA
Wood (cords)	60	58	6	11	NA	142
Coal (5 gal bks)	26	26	0	0	NA	1220

¹ ²In numbers of animals or fish, unless otherwise noted. ²Includes razor clams, surf clams, and cockles; most of the harvest is 3 razor clams. 3 Data not available.





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This area contains spruce-hardwood forests and wetlands accessible to Tyonek by road or along the McArthur River system. It extends south to Tuxedni Bay to include the nearest productive clamming areas and north to include marine mammal and waterfowl hunting areas accessible by dory along CookInlet. (Additional maps of resource use areas are found in Chapter 6.) Chapter 7 discusses some of the differences between this contemporary resource use area and areas used by Tyonek residents in the past.

HARVEST QUANTITIES

Table 8 reports harvest quantities in pounds edible weight for each resource taken by Tyonek households during the 12-month study period from February 1983 to January 1984. As shown in Figure 14, salmon comprised about 71 percent of total harvest by weight. About 94 percent of the salmon harvest was king salmon. Moose contributed about 21 percent of the total, other fish 3 percent, shellfish 2 percent, and plants, marine mammals, and small game including waterfowl one percent each. The dominance of king salmon and moose in the harvest totals suggests a relatively specialized resource harvest pattern. Nevertheless, as noted in the section on seasonal round and in Chapter 6, other resources taken in smaller amouonts were significant because of the season of their harvest and the variety they added to the diet.

Harvest quantities varied widely among households in the village during the 12-month study period covered by the survey (Figure 15). Nine households (12.5 percent) did not harvest resources, and 16 (22



Figure 14. Composition of wild resource harvests by percentage of edible weight contributed by each resource category, Tyonek, February 1983-January 1984.



Tyonek, February 1983-January 1984.

percent) harvested less than 250 pounds. Conversely, 32 households (45 percent) harvested over 1,000 pounds of wild foods. The mean household harvest for the village during the 12-month period was 964 pounds; the per capita harvest was 272 pounds. Table 8 presents average household harvests by resource category.

SOCIAL ORGANIZATION OF RESOURCE HARVESTING ACTIVITIES

Resource harvesting activities by Tyonek residents during the study period was largely shaped by kinship. That is to say, the people who cooperated together to harvest and process resources were most commonly kinsmen. The organization of groups by principles of kinship was apparent in moose hunting parties, salmon harvesting and processing groups, and clamming parties. These groups were usually composed of members of closely related households, with leadership provided by experienced, senior members of the extended family.

The extended family composed of several household units was the social group of primary significance in resource harvest and use. These cooperative groups formed of related households were most visible during subsistence salmon fishing. Figure 16 provides two examples of these multihousehold, extended family groups (see also Chapter 6). The first group was composed of four households with 13 members using one fish camp. The fishcamp owner's household (household 3) contained a widowed father and two unmarried sons. This household was assisted at the camp by a married son and his family (household 2) and a daughter (household 1). Also part of this fishcamp group was the household of the fishcamp owner's wife's sister (household 4). In the second example, a fishcamp



Figure 16. Two multihousehold, extended family units which harvested and processed salmon together, Tyonek 1982.

owner (household 3) was assisted in catching salmon by two of his sons, one of whom lived in a separate residence (household 2), an unmarried brother (household 4), and a single man not related to the owner (household 1). The salmon was processed in the village by another brother and his wife (household 5). The catch was divided among all five households according to household size. Thus five households with a total of ten people participated in this salmon harvesting and processing group. Extended families provided a pool of individuals of different sexes, ages, and levels of experience and skill to perform the roles essential to subsistence production. It was also within these extended families that major staples such as salmon were shared. Some households, especially larger ones, tended to harvest salmon independently, but even these cooperated with others in moose hunting and clamming. Also, each extended family and household was usually linked to others through networks of sharing, and sometimes members of different extended family production units formed partnerships or otherwise cooperated in resource harvest activities.

Fishcamps and smokehouses were said to be "owned" by particular individuals or households. These facilities commonly were shared with related households for harvesting and processing fish. Figure 17 provides an example of the sharing of fishcamps and smokehouses in Tyonek in 1982 (Foster 1982b:28-29). In this example, six households (1 through 6) with 13 people used fishcamp No. 1, owned by the father in household 5. Households 2 through 6 fished together at the camp, while household 1 received permission to use the camp from the owner, operating fishing gear separately from the other five households. Household 1 used its own smokehouse belonging to the fishcamp owner.



They each used their own smokehouse. Households 3, 4, 5, and 6 used both fish-camp (#1) and smokehouse (#3). Households 7 and 8 used owner's smokehouse (#3) Multiple unrelated households comprising work units at fishcamp (#1) and smokehouse (#3). The head of household number 5 owns fishcamp (#1) and smokehouse (#3). Households 1 and 2 used owner's fishcamp (#1) but not his smokehouse. but a different fishcamp. Figure 17.

Households 7 and 8, composed of five people, operated their own fishing gear at another site, but shared the smoking facilities belonging to the father in household 5, a brother of the head of household 7. In some other cases, unrelated households not part of the fishcamp owner's work groups were permitted to use the camp after the owners had processed their catch.

RESOURCE SHARING

Table 8 provides the percentage of the respondents to the 1984 survey who reported giving portions of their resource harvests to other households, and the percentage who reported receiving fish, game, or wild plants from successful harvesters in other village households. The results demonstrate that the sharing of wild resources was widespread and common in Tyonek. For example, 67 percent of the households received moose meat from other households, 36 percent received clams, and 35 percent received belukha meat or fat. This demonstrates that even resources that were not taken by a large number of harvesters were still commonly used in the village as a consequence of resource distribution. As illustrated in Figure 18, 65 households (90 percent) received at least one resource during the study period.

The fish or game harvested by a household often was received by a large number of other households, flowing out along lines of kinship. Figure 19 depicts the distribution of moose, salmon, and clams harvested by an extended family of eight households in 1983 (numbers 1-8 in the diagram), which comprised a work unit which harvested, processed, and shared wild resources together during the study period. Only resources



January 1984

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harvested by this extended family work unit are shown in Figure 19 (actually some resources harvested by households 9-13 also were distributed to include households 1-8). As was common in Tyonek throughout the study period, this extended family, multihousehold group provided a pool of individuals to perform resource harvesting and processing roles. The family's leader was an elderly widowed woman (household 8). Adult males within households 2, 3, and 6 were the primary harvesters, while women in households 3, 4, 6, 7 and 8 performed most of the processing roles. Individuals' roles within the extended family shifted from year to year depending upon involvement in wage employment and health. Resources were shared every year with all members of the eight household extended family. Products from all processed resources were distributed from the leader's household.

This extended family also shared its harvests with other village households, numbers 9-13 in Figure 19. For example, members of households 2, 3, and 6 traveled to Harriet Point in May 1983 and harvested 500 razor clams. Upon their return to the village, the harvesters shared their clams with households 4, 5, 7, and 8 of the core eight household unit, plus four additional households (9, 10, 11, and 12) not normally part of the resource production group..

During the 1983 subsistence king salmon season, members of this eight household unit harvested and processed 179 kings. These were shared among all eight households; also, because households 11, 12, and 13 lacked facilities to process smoked salmon, they received small quantities of these highly valued foods from household 8. Households 9 and 10 did not receive salmon, because they caught and processed their own with their own equipment and facilities.

Households 2 and 3 of this extended family harvested three moose during 1983, which were shared among 13 households. The distribution took place from the leader's home (household 8). The leader determined the amount and type of product to be given to each household. Her decision was based largely on the size and perceived needs of each household. Consequently, the successful hunters did not necessarily receive the largest portions of the harvest.

Figure 20 illustrates a second, similar example of a resource sharing network in Tyonek. An extended, multihousehold family (households 13-17) was composed of a father and mother and seven offspring in household 13, and the households of married daughters and sons. Most of the active harvesters in this extended family resided in household 13 during the study period, although members of households 14-17 regularly assisted the central household by performing processing roles. (This figure does not depict the harvests of households 1-12.)

As shown in the figure, razor clams were the most widely distributed resource. Approximately 2500 clams were harvested by households 13 and 14 during three trips by dory to Redoubt Bay in 1983. The clams were shared with 17 households, including the households of married siblings and married nieces and nephews. In contrast with clams, the 150 king salmon taken and processed by members of households 13-17 were mostly shared within the extended family of married sons and daughters, although other village households were permitted to use this family's fish camp and equipment to harvest their own salmon. Household 13's harvest of three moose in 1983-84 was shared with ten other households. In total, 18 households shared in the harvest of resources by members of households 13-17 in 1983-84. It should be noted that 1983 was the only





year in the last six that members of this extended family failed to harvest a belukha. Distribution of belukha meat and blubber would have undoubtedly extended well beyond the 18 households depicted in the figure.

As a consequence of the substantial harvests of fish and game resources and the sharing of these resources, fish and game comprised a large proportion of the protein sources consumed in the village during the study period. Respondents to the survey conducted in 1984 were asked to estimate what percentage of their household's consumption of meat, fish, and fowl was composed of wild resources. The results are presented in Figure 21. Over 61 percent of the respondents reported that half or more of their meat, fish, and fowl supply was harvested from local resources--for 11 percent of the households, this poportion was 90 percent or more. Of all households, about 12.5 percent said that they used no wild fish or game, and 26.2 percent estimated that from 1 to 49 percent of annual protein came from wild foods. Table 8 provides reported harvest quantities that may be compared with these estimates.

HOUSEHOLD CASE STUDIES

The following case studies illustrate several typical seasonal rounds, annual harvests, and sharing patterns of Tyonek households during the study period. Each refers to events of 1982. More detail will be added to these and other cases in the discussions of individual resources and resource categories which follow.



Households estimates in percent of consumed meat, fish, and fowl derived from wild resources, Tyonek, February 1983-January 1984 Figure 21.

Case Example A

This is an example of a Tyonek household that harvested a wide variety and a large quantity of wild resources throughout the study period. It is probably representative of about 20 percent of the village households. During 1982, household members included a husband and wife in their early 50s, several unmarried children, and one daughter's child.

In 1982, the wife held a full-time job in the village which an adult daughter filled during the summer while the wife assisted the family in subsistence and commercial fishing. The husband fished commercially and occasionally operated heavy equipment for the village. The household owned a variety of harvesting equipment, including a dory and motors, two pickup trucks, several all terrain vehicles and snowmachines, plus an assortment of rifles, traps, and nets.

The husband was one of the village clamming leaders. He and his sons harvested razor clams in spring in Redoubt Bay. The clams were mostly distributed to village residents, but some were preserved for use in winter. In May the household moved approximately ten miles from the village to their fishcamp at Beshta Bay. They harvested their limit of 70 king salmon and a substantial number of reds and silvers. This household also harvested king salmon for other members of their extended family. In addition, other households used their fishing sites and processing facilities during subsistence fishing. Later in the summer, the entire household fished commercially at the same site. Between open commercial fishing periods, the male household members hunted seal and belukha. They successfully harvested one belukha in 1982 and struck two others.

In the fall, the household harvested a variety of resources; in 1982 they took one moose, two black bear, grouse, porcupine, and silver salmon. They also picked berries. In the winter, the household used snowmachines to hunt small game, to fish for trout through the ice, and to collect wood.

The household shared a large portion of its harvest with the households of several relatives, including married children, and the wife's elderly mother and brother.

Case Example B

This is an example of a Tyonek household that in 1982 harvested resources from the major categories utilized in Tyonek-- salmon, moose, wood, and plants-- but usually did not harvest resources requiring large expenditures of time for a relatively small return, such as seal or clams. It also is an example of a household that extensively shared resources, facilities, and equipment with other Tyonek residents. In these characteristics, it was typical of the resource use patterns of the majority of Tyonek households. The household consisted of a man in his 40s and his teenage son. For most of the study period, the father worked full-time for the village in a job that demanded considerable time committments. he household head owned a fishcamp at Beshta Bay. During king salmon season in 1982, he shared the camp and his gear with four other households, including that of his other unmarried son; an unrelated, unmarried man; an unrelated older man and his elderly mother: and a household composed of a temporarily disabled husband, his wife, and their four young children. The fishcamp owner provided these people transportation in his pickup truck to the camp. The owner also maintained a smokehouse in the village which he shared with five other households. Because he had a full-time job. he arranged for his brother to process his salmon in return for one-half of the finished product. He also took some time off in the summer of 1982 to enter into a partnership with a village commercial fisherman.

In the fall, the household head hunted moose with his truck along the logging roads. He supplied moose meat to village elders, including those in the next case. This man also collected berries and wood with his truck. His household received clams, bear meat, and waterfowl from Tyonek people who harvested these species. As is typical in Tyonek, no direct exchange was involved; individuals shared resources with no expectation of an immediate return.

Case Example C

During the study period, this household consisted of an elderly man and his unmarried son. Both were highly respected for their knowledge of Dena'ina history and traditions. Although both men were extremely active hunters, fishermen, and trappers in the past, poor health and age restricted their harvesting activities during the study period. Their cash income was small.

The father and son participated in the Tyonek subsistence fishery in 1982, and harvested about 30 king salmon. They also incidentially caught 10-20 reds. The son froze, salted, pickled, and canned these fish, although he shared about one-third of his catch with a female relative. The son also occasionally helped others during the commercial season and received fish in return. He also fished for silver salmon with nets in the summer and fall, and caught silvers and rainbow trout in fresh water in September with rod and reel. The son fished for hooligan with a gillnet and also collected them on the beach when they were washed up by the strong surf. Both men harvested plants for their food and medicinal qualities. Because of their status as village elders, these men received large quantities of fish and game from relatives and from serveral village leaders who made a special effort to provide for older Tyonek residents. In 1982, the household received belukha, bear, moose, waterfowl, several salmon species, and trout.

RESOURCE USE PATTERNS OF TEMPORARY RESIDENTS

As illustrated in Table 9, several significant differences existed between the sample of 72 permanent Tyonek households and the eight households comprised of teachers and others who were living in Tyonek because of government-related employment. As a whole, the eight households were active resource harvesters during the study period, especially in taking freshwater fish and small game, for which they were as active as the village average. In contrast to most village households, however, they harvested much less salmon and were generally unsuccessful or inactive in hunting moose. Overall, the temporary households harvested a mean of 183 pounds of resources during the study period. The per capita harvest was 81 pounds.

Several reasons can be suggested for these differences. Harvesting and processing large amounts of salmon required equipment (boats, motors, nets) and facilities (camps, drying racks, smokehouses) that no temporary resident owned at the time of the study. A few borrowed the facilities of other Tyonek households to put up fish, while others used less efficient rod and reel gear. Thus, the lower salmon harvests may be due to lack of equipment. Also, it is likely that newer residents did not share the food preferences of more long-term residents, who had grown up eating salmon at many meals throughout the year. Thus, lower salmon harvests may be due to culturally-influenced food tastes.

Concerning moose, other factors may have obtained. Few newcomers were familiar with local hunting areas, which decreased a hunter's

RESOURCE HARVEST ACTIVITIES OF PERMANENT AND TEMPORARY TABLE 9. RESIDENT GROUPS, TYONEK, FEBRUARY 1983-JANUARY 1984

					MEAN HOUSEHOLD			
	PERCENT HARVESTING			HARVEST QUANTITIES ²				
	Permanent Residents n=72	Temporary Residents n=8	Significance ¹	Permanent Residents n=72	Temporary Residents n=8	Significance		
All Salmon	81	88	NS	44.3	12.6	***		
King Salmon	78	50	NS	36.2	4.8	***		
Red Salmon	54	38	NS	3.1	1.0	**		
Silver Salmon	43	63	NS	4.4	6.6	***		
Pink Salmon	1	13	NS	. 2	.3	NS		
Chum Salmon	4	0	-	.4	0	NS		
Hooligan ⁴	25	25	NS	.3	.6	NS		
Freshwater Fish	15	50	NS	5.1	11.6	NS		
Rainbow Trout	13	50	*	2.7	7.3	NS		
Dolly Varden	11	38	NS	2.4	4.1	NS		
Grayling	1	13	NS	<.1	.1	NS		
Whitefish	1	13	NS	.1	0	NS		
Clams ⁴	15	38	NS	1.1	.5	NS		
Belukha	4	0,	-	<.1	0.	**		
Moose	35	03	-	. 4	03	***		
All Furbearers	7	13	NS	. 4	.1	NS		
Red Fox	1	Õ	-	<.1	Ō	NS		
Weasel	Ō	13	-	0	.1	NS		
Beaver	7	0	-	.4	0	NS		
All Small Game	33	50	NS	1.6	11.0	NS		
Porcunine	14	13	NS	2	1	NS		
Hare	0	13	-			NS		
Grouse	24	50	NC	1 1	6.0	NC		
Ptarmigan	7	50	**	.3	4.4	NS		
All Waterfowl	36	50	NC	a 1	3 3	NC		
Ducke	36	50	NG	3.0	2.5	NC		
Geese	7	13	NS	.1	.1	NS		
5								
Plants	64	88	NS	12.0	8.1	NS		
Wood	58	75	NS	2.0	2.1	NS		
Coal'	26	13	NS	16.9	1.3	***		
¹ Significance			2	In number of	animals/fis	sh unless noted		
- Not tested	i, sample si	ze too small	-	one household	assisted a	permanent		
ns Tested, no	ot significa	nt		household in	harvesting			

ns Tested, not significant * Significant, 0.05-0.10 level ** Significant, 0.01-0.05 level *** Significant, 0.01 and below

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4 household in harvesting moose 5-gallon buckets 6 quarts cords

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chance of getting a moose. Further, most were engaged in full time employment, which prohibited them from devoting the large amounts of time often necessary to harvest a moose. During the study period, a few temporary residents hunted with long-term households, and one assisted with a kill in 1983. Others tended to hunt alone, or with other temporary residents.

Freshwater fishing with rod and reel entailed the use of methods and means more familiar to newcomers to the village. Also, several lakes and rivers are close to the village, affording an opportunity to engage in this recreational activity on weekends. Small game could be taken incidently while traveling along the local network of roads and trails.

Several temporary households participated in clamming trips organized by "clamming leaders". Also, most of these eight households received gifts of smoked salmon, clams, and belukha, and occassionally shared meals with long term households.

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CHAPTER 6

RESOURCE HARVEST AND USE PATTERNS BY RESOURCE CATEGORY

This chapter describes patterns of use of specific resources in more detail. Areas covered include regulations, harvest methods, levels of harvest and effort, geographic use areas, preservation and food preparation techniques, and resource sharing and distribution patterns associated with each resource category used in Tyonek during the study period.

SALMON-NONCOMMERCIAL

As discussed in Chapter 2, five species of Pacific salmon migrate up Cook Inlet to spawn in streams in the Tyonek area and in the Susitna River drainage. King salmon arrive first, usually by mid May, and run through most of June. Red salmon also appear in May and June followed by pink, chum, and finally silver salmon in late July, August, and September. During the study period, salmon were taken by Tyonek households for subsistence use and for commercial sale. This first section will describe the subsistence use of salmon, while the next will discuss the commercial fishery.

Subsistence Fishing Regulations

The history of some of the regulations governing the harvest of salmon at Tyonek was reviewed in Chapter 3. As explained in that chapter, subsistence fishing for king salmon in May and June was opened by regulation in 1980 after a closure of 16 years. During the study period, legal gear consisted of set gill nets not exceeding 10 fathoms in length, six inches in mesh size, and 45 meshes in depth. In 1980, subsistence fishing occurred during ten open periods of 12 hours each from May 23 through June 15. Each household was allowed a maximum harvest of 50 king salmon, with a limit on the total community harvest of 3,000 kings. From 1981 through 1984, regulations increased the limit to 70 king salmon per household, with a total harvest for the village of 4,200 kings. In addition, each permit holder could harvest 25 salmon other than kings, and 10 additional salmon other than kings for each household member. Subsistence fishing was open from May 15 through June 15 during three, 16 hour openings per week, plus on Saturdays for 12 hours from June 16 through October 15 (ADF&G 1983e)

Harvest Levels

Harvests for the Tyonek subsistence salmon fishery are summarized in Table 10. King salmon harvests averaged 2,100 fish over the five seasons and have ranged from a low of 1,565 fish in 1982, to a high of 2,750 in 1983. Accompanying the king run is an early run of red salmon. About 230 of these fish were taken on average each year, incidental to the king harvest. As shown in Figure 22, the differences in total harvest from year to year were related to the success of fishermen in the first two weeks of the fishery in May, since June harvests have been relatively stable. This can be largely attributed to the timing and strength of the runs. In years when salmon were available early, as in

	1980 ^a n=67	1981 ^b n=70	1982 ^C n=69	1983 ^d n=75	1984 ^e n=71	
King salmon	1,936	2,002	1,565	2,750	2,354	
Red salmon	262	269	209	185	na	
Silver salmon	_	64	-	40	na	
Pink salmon	-	32	-	-	na	
Chum salmon	-	13	-	2	na	
Dolly Varden	-	15	11	1	na	
Rainbow trout	1	-	6	-	na	
Whitefish	-	-	1	-	na	

TABLE 10. TYONEK SUBSISTENCE SALMON HARVEST DATA 1980-1984

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a Stanek and Foster 1980
b Webster 1982
c Ruesch and Browning 1982
d Ruesch and Browning 1983
e Browning pers. comm., 1984

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Figure 22. Tyonek subsistence salmon harvests, comparing the harvest totals of May fishing periods and June fishing periods, 1980-1984.

1983, fishing effort increased gradually and then peaked as fishermen learned of the success of others (Fig. 23). In contrast, during years when early fishing periods were unproductive, such as 1982, effort decreased after an initial period of "test" fishing and did not increase until catch per unit effort (CPUE) improved (Fig. 24). Generally, CPUE appears to be directly related to run strength (Ruesch and Browning 1984:3). After several consecutive periods of good harvests, most Tyonek fishermen reduced their fishing effort while the salmon were being processed. Consequently, harvest totals for open periods usually dropped after a few periods of successful fishing (Fig 25). In years when the salmon arrived early in large numbers such as 1980 and 1983, harvest totals per open period displayed two distinct peaks, the first representing the first major harvest effort as success improved, and the second being a renewed effort after the initial harvest had been processed. In 1982, the salmon were late and the first peak in harvest did not occur until past the midpoint in the open season. The second peak in effort was just developing when the season closed. In addition to run strength, previous harvest success, and processing requirements, other factors influencing the amount of fishing effort included weather conditions, the availability of labor for harvesting and processing, and the condition of fishing gear and processing facilities.

Subsistence Set Netting: Harvest Methods

During the study period, the mid-spring appearance of kings during their migration provided the first opportunity for the people of Tyonek to harvest fresh salmon after winter supplies of preserved fish had been



Figure 23. Fishing effort, Tyonek subsistence fishery, by open period, 1981-1983.



Figure 24. Catch per unit effort, Tyonek subsistence fishery, by open period, 1981-1983.



Figure 25. Harvest of king salmon by open period, Tyonek subsistence fishery, 1980-1983.

depleted. This was an important time prior to the commercial fishing season to catch, preserve, and store supplies of fish used throughout the fall and winter months. Kings were also of major social significance because their products were shared and distributed among almost all families in the community.

Preparations for king salmon subsistence fishing began after the ice left the upper inlet in March and April. Fishermen set their nets at sites located between the village and Granite Point, eight miles to the southwest (Fig. 26). Permanent fish camps, equipped with cabins and in most cases processing facilities, such as racks and smokehouses, were located along the shoreline from North Foreland southwest to Granite Point. Many of these camps have been in existence since the early 1940s (Foster 1982b:4-6). Most of the 28 camps occurred in one of four "clusters." the location of which was determined by beach access, availability of fresh water, and proximity to good fishing sites. Each camp had an owner, who held the right to occupy the buildings and fish the adjacent beaches. Often, owners granted permission to other Tyonek families, usually relatives, to use the camp's facilities. Commonly, two or more households cooperatively harvested and processed salmon at the camps.

Case Example D

The following case illustrates how one group of related Tyonek households prepared for subsistence salmon fishing and used their fish camp in 1982. It is illustrative of many other families' fishing activities in the village during the study period.





Near the end of April 1982, during a minus 4.2 tidal period, the fish camp owner in Figure 27 and two of his teenage sons set out buoys and running lines to be used for anchoring boats and attaching nets at the camp at Beshta Bay. They opened buildings for airing and repaired the roof of the smokehouse and the main cabin door which had been broken by a brown bear. Several nets were taken out of storage, a few holes were mended and new plastic floats added. Since the family was going clamming the next day, the man and his sons loaded clam shovels, plastic buckets, and an empty 55 gallon drum into the 22 foot wooden dory.

During the next 20 days, orders of equipment and food supplies were made through the local store and from Kenai and Anchorage. On a calm day with relatively small tidal fluctuations the owner and one son made a run with their dory to Anchorage for supplies. While there a friend helped them gather four drums of gasoline, six cases of quart size canning jars, twenty loaves of bread, and six dozen eggs.

Several days before subsistence salmon season began the husband, wife, four sons, and two daughters moved from their village residence to their 20 x 20 foot log cabin at the fishcamp. Two sons rode from the village in the dory loaded with supplies, while the wife and four children drove their truck along a gravel road connecting the village to the camp.

Since the boat arrived first at camp the sons unloaded the supplies at the foot of the bluff near the cabin, and took the boat to moorage in a nearby creek. By the time they walked the beach back to camp, the rest of the family had arrived, and everyone helped carry supplies up the bluff to camp. Food supplies were stored on shelves and in boxes, sleeping bags laid out, a propane gas bottle hooked up to a coleman stove, and white gas lamps were filled. Two tent frames were draped with cotton wall tents to serve as additional sleeping quarters, and the family's two pitbull terriers were tied near the smokehouse. The husband and sons took the truck back along the road, cut a load of wood blocks and hauled them to camp where they were unloaded near the cabin, smokehouse, and steambath. The wife and two daughters had meanwhile cooked a meal of rice and moose stew.

All that night a strong southwest wind blew. By morning, the wind and surf had beached hundreds of hooligan which had been swimming up the inlet during the previous night's high tide. Many of those washed ashore were still attempting to get back to water. During the next hour the family gathered three and one-half, five gallon buckets of hooligan. One half bucket was kept at camp, while the sons took the truck back to the village and distributed the remainder to their grandmother and uncle, a brother and sister and their families, an uncle and aunt, and an elderly man and his son.




Two basic methods were used to set nets along Tyonek beaches during the study period. The most commonly used was the drag anchor method. A heavy weight such as a stone or old motor part was tied to the outer end of the leadline by a piece of rope, and the in-shore end of the floatline was attached to a long line, itself tied to a stationery object like a stump, driven pipe, or rock. In the second method, the net was attached to a running line, a continuous rope laying perpendicular to the beach and run through a pully system at either end. As incoming waters floated a net it was kept a short distance out from the water's edge in order to catch fish swimming close to the beach. If circumstances were such that a fisherman wanted only a portion of the net in the water, he simply pulled dry the unwanted portion while the remainder continued fishing. Both of these methods allowed nets to be tended continuously during the time they were in the water, and were effective in preventing fish from dropping out of the net. All fastenings had to be sufficiently strong to withstand the sometimes rapid tidal currents of incoming water, and light enough to be pulled in when fish were caught. Generally people used standard manufactured gear ranging from 2 1/4 to 5 1/8 inches in mesh size and as short as 5 fathoms in length. A float line was attached to the top edge and a lead line to the bottom edge.

Case Example D, continued

This example continues the account of Case D and illustrates the fishing methods used by these households at their camp along Beshta Bay in 1982.

The day was Tuesday, the beginning of king salmon season. Because high tide was at 3:30 p.m., there was time in the morning for the sons to get the net, ropes, anchors, small skiff, and burlap sacks down to the fishing site.

On the first day of season the household set out their ten fathom net, attaching it to a running line. Only two medium size kings were caught. That evening one king was filleted, cooked over a birchwood fire, and eaten at a late evening meal. The second fish was covered with moist burlap near the smokehouse, later to be cut and hung in the smokehouse.

Since open fishing periods during the season alternated with days off, the next day, Wednesday, the family spent around camp preparing a small plot of ground for a vegetable garden, splitting wood, putting up a make-shift basketball hoop, and cleaning the steam bathhouse.

On the next day of fishing, the family had to wait most of the day for the incoming tide. Two more sisters and their families who lived in their own households (households 1 and 2 in Fig 27) drove from the village to help with fishing. At camp, the mother and daughters prepared an early meal of fresh salmon, bar-b-qued over a wood fire, rice, canned vegetables, pork and beans, potato chips, pop, coffee, and sweet rolls. Afterwards everyone relaxed in the warm spring sunshine. The husband sat on his wooden bench on the edge of the bluff and watched the incoming tide move over the mud a mile out in the inlet. When the brackish, muddy water completely surrounded the big boulder a half mile offshore, he called for his sons to get out the net. Two sons dropped the ends of the net over their shoulders, while two other sons carried lines, anchors, and burlap. As they headed down the narrow path to the fishing site nine other family members followed carrying bags of food and coats, boots, and other personal belongings. One hundred yards down the gravel beach the net was laid out perpendicular to the beach at the water's edge. Instead of using the running line, that day they used the anchor method for securing the net.

The rest of the family took their things to a large cottonwood log which had years ago washed up at the base of the grassy bluff. Near the old log three boys, 12, 11, and 8 years old and their sister 11, gathered sticks and started a campfire. Everyone sat either on the big log or nearby on the washed gravel beach crest.

Although the incoming tide moved rapidly, the water's surface appeared smooth. Soon six feet of net was in the water and the floats formed a small semicircle on the surface. Suddenly the float line was jerked under water with a splash, slowly it rose to the surface and a giant tail broke the quiet surface with a loud crack. Within minutes three more large kings were in the net and the father ordered the net pulled so as not to lose the big fish. Since the net being used had only a 4 5/8 inch mesh, large kings were caught only by their teeth and then wrapped themselves in the net as they twisted and rolled to escape. When the net was pulled there were seven fish of 35 pounds and larger. The boys deftly removed the fish and tossed them on the beach. The father, mother, daughters, and young boys each grabbed a fish by the tail and dragged them to the beach crest. There the fish were laid on a bed of fresh picked green grass and covered with wet burlap sacks.

By the time high tide touched the beach crest the net had been pulled seven times. Twenty-eight kings ranging in weight from 18 pounds to 47 pounds lay waiting to be counted and have scale samples taken by the Fish and Game technician.

After the tide had receded, the pickup truck was driven onto the beach, the fish were loaded in the rear and driven up the steep slope to the smokehouse. Here they were offloaded and, again, placed on a bed of green grass and covered with moist burlap sacks in the canvas-covered cutting area. They lay here overnight. Additional fish were caught the next day. Friday, which was windy with a light surf. Only six medium size kings and two red salmon were caught, a typical pattern of harvest for the beginning of the season. Processing occurred over the weekend.

Processing Methods

After harvest, king salmon were usually left in a cool, shaded place for one to three days. During this time the fatty tissue breaks down and oils become free flowing within the flesh. The high oil content of king salmon makes them very desirable for smoking and drying while remaining highly palatable.

During the study period, Tyonek residents used five basic methods to preserve salmon: smoking, canning, freezing, salting, and fermenting. Of these five methods, smoking and fermenting date to before the arrival of Euro-Americans in Cook Inlet. Salting has been practiced since the time of early explorers and traders; canning for home use began in the early 20th century, while freezing first became common in the 1960s when electricity became available in the village. Households generally preserved certain portions of their harvest by each method depending upon their intended use, available storage space, and knowledge and skills of preservation techniques. Figure 28 reports the estimated percentage of Tyonek's total salmon catch in 1982 that was preserved by each method.

Smoking was the most commonly used preservation method and often preceded either canning or freezing as storage techniques. Smoked products were also stored in boxes in a cool, dry place Dehydration sometimes resulted in some spoilage during dry winter months. Salting was a highly favored preservation method because fish could be kept almost indefinitely in plastic buckets. Salted fish was not subject to the accidental spoilage of frozen fish when freezers broke down or shut off during electrical outages. Canning and freezing were also commonly practiced preservation methods. The latter was very widely used (20 percent of the catch) because of its relative ease. Canning has recently become expensive and requires considerable effort; some 11 percent of the catch was canned.

Most salmon processing took place near smokehouses. In 1982, there were 18 smokehouses in the village itself and an additional ten at the Beshta Bay fishcamps. Most were located in the village because supplies of running water, required for salmon processing, were readily available. Since the construction of a local road network in the 1970s, transport of salmon harvests by pickup truck to the village has been quite convenient, and most salmon processing now occurs there. Smokehouses in Tyonek varied widely in size (from about 4 foot sides to about 8 feet by 12 feet), but all were constructed of loosely fitting boards which allowed ventilation and the escape of smoke and heat. Each





smokehouse was shared by two or more households during the study period (Foster 1982b:8-10,29).

When salmon were prepared for smoking in Tyonek there were several traditional ways in which the flesh and parts were cut depending upon the intended use. Each of these products was referred to by its respective Dena'ina name. Not all households prepared or utilized each product or part, but from 48 to 90 percent of a sample of 39 households in 1982 utilized 9 of the 11 categories listed in Figure 29.

The following is a generalized description of methods of processing king salmon used in Tyonek during the late 1970s and early 1980s. (The interested reader should also consult Foster 1982b:10-18.) As salmon were selected for processing, the person who led this activity, generally an older woman or sometimes a man, decided how much of the total harvest to prepare or preserve by each method. The size of fish influenced this decision to a great degree, since large fish are more suitable for certain cuts. Cutting began with the removal of the head, fins, tail, "tips," and internal organs (Fig. 30 and 31, Plate A). Rarely, the tail was left on. Various internal parts such as the heart, liver, eggs, stomach, or milt were saved for later use. The heads were usually kept, cut as illustrated in Figure 32, and then hung in the smokehouse, pickled, or salted. The fins from large fish were also often smoked.

The most commonly prepared king salmon product was smoked strips called <u>balik</u>. These were prepared by cutting the fillets of large kings into long narrow strips with the skin left on to hold the flesh intact (Fig. 33, Plate B). After soaking in a brine solution, two strips were tied together with a string at one end and then hung over a pole which







Figure 30. Removal of the fins and tail.



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Figure 31. Removal of the "tips".



Plate A. Processing king salmon: removal of the head, fins, and tail.



Figure 32. Removal of the lower jaw and cuts made from the under side of the fishhead.



Figure 33. Cutting salmon fillets into strips to be smoked.



Plate B. Preparation of <u>balik</u> from king salmon. Strips dry outside for a few hours before being placed in the smokehouse.



Plate C. <u>K'iytin</u>: king salmon backbones.

was placed in the smokehouse. The backbone with some flesh remaining after the fillets had been removed was smoked to make a product called <u>k'iytin</u> (Plate C). On large kings a significant portion of flesh remained on the backbone after the fillets were removed. This flesh, cut away in fillet fashion, called k'enut', was also smoked.

Another method of filleting kings was to remove the head and fins, and to remove a fillet by cutting from the dorsal process, but leaving the belly uncut. A layer of flesh 1/4" to 3/8" thick was left on the skin, resulting in a product called <u>baba</u>, looking much like a pair of pants (Fig. 34, Plate D). Next, green willow or alder sticks stripped of bark were inserted to hold the fillet flat while it was being smoked (Plate E). Baba was also made from sockeye salmon.

In three-fourths of the Tyonek households, some fish was salted in plastic buckets or wooden kegs. Salt fish, <u>saluna</u>, was produced by layering pieces of salmon, including heads, fins, tails, tips, or fillets, with $\frac{1}{2}$ to $\frac{1}{2}$ inch of rock salt between layers (Plate F). As the mixture set, moisture in the fish came out to form a brine solution. The layers were weighted with a heavy object and became immersed in the brine, thus preventing spoilage.

As discussed above, processing salmon in Tyonek was most commonly accomplished by multiple household groups usually linked through kinship ties (Fig. 16). In multi-household groups, the owner of the harvesting and processing equipment, or the owner and his wife, organized the salmon processing. These persons were always present during the cutting of the fish. Tasks such as hanging fish or washing cut portions were usually performed by younger, less experienced family members. The cutting itself was usually the job of more experienced,



Figure 34. Baba prepared for smoking.



Plate D. Preparation of <u>baba</u> from king salmon.



Plate E. Salmon products hang in a Tyonek smokehouse to dry.



Plate F. Making salt fish, saluna, from king salmon.

skilled, older people. Generally this was a female task, but men assisted if the catch was large. Younger participants received instructions or were able to observe salmon processing activities while assisting with other chores.

Case Example D, Continued

This example illustrates the social roles involved in processing and preserving salmon at a Tyonek fish camp in 1982. The same households were involved as in the previous two examples (Fig. 27).

At the fishcamp the husband and wife were up early on Saturday to prepare breakfast and set up facilities for processing fish. Together they decided on the number of fish to cut into various products. Several small kings were carried from the storage area down the bluff to a cutting table located near a pipe taped into a spring which provided continuous flowing water. Processing began by washing the entire fish of any dirt and slime. The wife cut the small kings into <u>baba</u> and filleted off the meat next to the backbone. The heads, fins, tips, and hearts were kept in containers of fresh water. Because the backbones were too small they were discarded along with the intestines into the inlet. The children had gathered some alder sticks and stripped the bark. Their father inserted the sticks in the wide pieces of flesh. Two sons took them to the smokehouse where they were hung from the top racks.

On their return to the beach the sons brought two more large fish weighing 35 and 45 pounds. This time the husband removed the large heads, fins, tail, and tips. He gutted the fish and removed two thick fillets. Another inch of flesh was removed from near the backbone (which was saved) and slits for drying cut between every other bone. Next the inch and one-half thick fillets were placed on the cutting table and cut into long strips one-inch wide. As these were cut the children placed them in a bucket containing a sweet salt brine solution. Meanwhile the wife split the heads and they, too, were put in the brine. After 20 minutes the children removed the strips and tied one end of each strip to the end of another with string. These were hung on a pole outside and left to drip excess brine. Later they were taken inside and hung closely together on wooden racks. By the time all 28 fish were cut, the smokehouse was full of racks hung with cuts of balik, baba, k'iytin, k'enut', heads, and several clusters of eggs.

At the end of the season they had caught 62 king salmon and 20 reds. Over half their fish was smoked in the smokehouse; some of this was later canned and the rest frozen to maintain freshness. Equal portions of fresh salmon were canned, frozen, and salted; throughout the season fresh salmon was eaten almost daily in soups, chowders, fried, or bar-b-qued.

Case Example E

A second example of how a group of related households functioned together is provided by an extended family composed of several households which utilized three different fishing sites in 1982 but shared their elderly mother's processing facilities located at her home as the center for processing and distribution of salmon products (Fig. 35). After salmon were harvested they were brought to the mother's house and stored. Since each household had a subsistence fishing permit and fished at different times, salmon were brought to the mother's home throughout the season. She usually took the lead in deciding which methods were to be used to process each fish and was always present when processing took place. She was very active in teaching her daughters and granddaughters how to perform each task. Unless there was a great deal of fish only the women processed the salmon. However, when large numbers had to be processed several men assisted.

When salmon were processed the leader divided the products among her family members according to their household size and needs.

Food Products

There were many different methods of preparing traditionally processed salmon into food dishes used in Tyonek during the study period. Salmon chowder and soups were made from almost every portion of the salmon. Fresh, salted, and smoked salmon provided a variety of flavors in these dishes.

Fresh salmon was used in soups and chowders during the spring of the year when the first salmon were caught. The salmon was dressed, cut up into serving size pieces including the head, and added to the broth. Fresh salmon fillets were fried in oil or grilled over an open fire and





eaten with rice as a main dish. Salmon milt sacks and hearts were sliced thin, rolled in flour, and fried in oil.

Salted salmon were used during the winter months of the year when fresh fish were not available. Traditional cuts of salmon (heads, fins, tail sections, fillets) which were preserved in salt were all used in soups and chowders. Salt fish was soaked in fresh water for several hours before use to remove most of the salt which the flesh had absorbed, leaving the salmon with the texture of fresh fish and a slightly salty taste. Salt fish fillets were fried in oil and eaten with rice just as fresh salmon. The fillets were also cut into small bite-size pieces and placed in a pickle brine. Pickled fish was eaten as a side dish to a main meal or as a snack.

Smoked salmon products (backbones, heads, fillets, roe, stomach) were also used in soups and chowders. Occasionally smoked strips were added to soups to give them a smokey flavor. This food was called <u>tadi</u>. Smoked strips (<u>balik</u>) and fillets (<u>baba</u>) were usually eaten as a side dish or as snacks. Another dish often made was fish pie, <u>biruk</u>. Fresh fish, soaked out salt fish, or frozen fish was combined with rice, cabbage, and other ingredients to make this dish. Scraps of flesh from processing salmon and salmon eggs were occasionally placed in a container with oil and allowed to ferment to make <u>chuqilin</u>. Dried berries and chuqilin were mixed together to form a pudding-like substance called <u>k'enkash</u>. These two dishes were enjoyed by the elders of the village. Canned salmon was used in a variety of dishes including salmon and rice and fish pie, or just out of the can as the main dish in a meal, or as a snack. Although consumed throughout the year, these

dishes comprised all the major meals for many households during the 40-day observance of Russian Orthodox Lent in March and April of each year.

Freshwater Salmon Fishing

As noted in Chapter 3, traditionally the people of the Tyonek area took salmon in freshwater streams and lake outlets with basket traps, weirs, dipnets, and fish spears. In historic times, gill nets were employed. During the study period, subsistence fishing for salmon in freshwater was closed throughout the Cook Inlet drainage. Therefore, fishing for salmon in freshwater in the Tyonek area was restricted to the use of rod and reel under sport fishing regulations. Generally, for salmon other than kings, regulations during the study period allowed a catch of three salmon of 16 inches or more per day, with a three salmon possession limit. For salmon under 16 inches, the limit was ten per day, ten in possession. Most of the west side of Cook Inlet was closed to king salmon fishing in freshwater during the study period. In 1983, sport fishing for kings was allowed in the Chuitna River. For kings over 20 inches in length, limits were one per day, two in possession; for kings under 20 inches in length, ten per day, ten in possession (ADF&G 1983c:18-19).

Areas used by Tyonek residents to take salmon in freshwater during the study period are depicted in Fig. 36. Mostly, freshwater fishermen targeted for silvers in September while hunting for moose along the McArthur, Middle, and Chakachatna rivers. These fish were eaten at hunting camps, or stored for winter use. A few Tyonek residents



participated in the Chuitna River king salmon fishery. Indian Creek, which runs through the village, was a popular rod and reel fishing stream, especially for children. Also, several older people used snares made of willow to take a few spawned out salmon in Second Lake.

SALMON - COMMERCIAL

As mentioned in Chapter 3, residents of Tyonek sold salmon to commercial buyers as early as the 1880s. However, commercial fishing was not a significant part of Tyonek's economy until the 1930s. Prior to that time, Tyonek residents were unable to afford commercial fishing equipment and competing fishing interests from outside of Tyonek had appropriated most fishing sites. In the 1930s, village residents organized a cooperative commercial fishing effort, using a large fish trap and selling the catch to Cook Inlet canneries (Osgood 1937:191; Chapter 3). Since the early 1940s, set netting has been the primary type of commercial fishing activity practiced by Tyonek residents. From time to time as many as three people have fished in the commercial drift fleet, but no one did so in 1983.

Regulations governing commercial salmon set netting (ADFG 1983d:69-83) in the Northern District provided for 2, 12-hour weekly openings which began on June 25 and closed by emergency order. The allowable size of set gill nets was no longer than 35 fathoms or deeper than 45 mesh with 6 inch maximum mesh size. Each fisherman was allowed to operate not more than 105 fathoms of set net. Equipment used for commercial set net fishing consisted of wooden dories, from 15-24 feet in length, one or two outboard motors, pickup trucks, nets, floats, and raingear.

During 1983 commercial fishermen in the Northern District of Cook Inlet had a very poor year. There were few fish harvested concurrent with depressed market prices due to record catches in lower Cook Inlet and Bristol Bay, which flooded the canneries with fish. Tyonek fishermen received \$.65 per pound for red salmon, \$.35 per pound for silver salmon, \$.20 per pound for chum salmon, and \$.10 per pound for pink salmon. This was a drop of approximately a 30-40 percent in prices per pound from the previous year.

In 1983, 39 percent (28) of Tyonek households had one or more member who participated in the commercial fishery. There were approximately 25 limited entry setnet permits held by residents of Tyonek in that year. Four households not owning a permit fished for permit holders and received a share of the profits. Family members of permit holders commonly obtained crew licenses and worked together. Commercial fishing sites were located from one mile south at Chuitna River to Granite Point. The bulk of these sites were along Beshta Bay, where commercial fishermen had fishcamps near their fishing sites. These were generally the same sites used for subsistence fishing.

Salmon have been sold to several different processors over the past few years. A tender boat was sent to Tyonek, usually from Kenai or Homer, to pick up harvested salmon. The commercial buyers, and hence the Tyonek commercial fishermen, have had difficulties with this system due to the distance the tender must travel and the relatively small harvest which occurs in the Tyonek subdistrict. Consequently, the Tyonek commercial fishery is generally a marginal one; as shown in Chapter 4, cash incomes are low compared to those of other Cook Inlet commercial fishermen.

Salmon were sometimes removed from commercial catches to supplement the household supply of fish. The number removed depended upon the price being received for that species of salmon and the perceived needs of the family for cash or a winter's supply of salmon. In 1983, commercial fishermen in Tyonek reportedly distributed chum salmon to village households rather than sell them for 20 cents a pound.

HOOLIGAN

During the last week in April and early May hooligan (eulachon, smelt) pass by the beaches of Tyonek on their way up Cook Inlet to freshwater drainages such as the Beluga and Susitna rivers to spawn. There are also smaller runs later during June. Historically, large quantities of hooligan were taken by the Upper Cook Inlet Dena'ina with dipnets from wooden platforms extending over the mud flats (Fall 1981:191,193).

Regulations

Currently, the harvest of hooligan in the Tyonek area is regulated by the Alaska Board of Fisheries (Alaska Department of Fish and Game 1983e:34-36). During the study period, subsistence fishing regulations allowed the harvesting of hooligan in salt waters of the Northern and Central districts of Cook Inlet from April 1 through May 31. Legal gear was gill nets not longer than 50 feet with a mesh size no larger than two inches. There was no possession limit for hooligan; a permit was required, however.

Harvest and Use Patterns

The total harvest level of hooligan at Tyonek during 1983 was about 3,500-4,000 fish. Twenty-five percent of Tyonek households harvested an average of 1.2 five-gallon buckets of hooligan. Twenty-two percent of the households in Tyonek indicated receiving hooligan. The harvests occurred along the gravel beach from the village south to Granite Point (Fig. 37).

Hooligan were harvested in two ways. Most of the harvest was taken with small mesh set nets, placed on the beach during incoming tides. A very small incidental take of king salmon occurred during the hooligan fishery. The second method involved collecting hooligan washed ashore on the beach by a strong surf or storm. In the past several years, there were thousands of hooligan washed ashore at Tyonek. When this happened, villagers rushed down to the beach with plastic garbage sacks and buckets to pick up the fish before they dried out or were damaged by shorebirds.

Hooligan were usually eaten fresh, gutted, beheaded, and then fried in oil or baked. Some were processed for use at a later date. One method of preservation was to freeze several dozen hooligan in a container filled with water. Another method of preservation used by some households was to salt the hooligan in wooden kegs or plastic buckets.

Distribution and sharing of hooligan occurred during the spring when households were eager for fresh fish after a long winter of pre-



served foods. When small amounts of hooligan were harvested, they were not preserved but rather were distributed and consumed fresh. Only when large quantities were harvested were hooligan preserved for use later.

FRESHWATER FISH

There are two species of freshwater fish locally available to residents of Tyonek, rainbow trout and Dolly Varden. Historically, freshwater fish were taken in spring with basket traps (Fall 1981:190) or during the winter through the ice with hook and line (Osgood 1937:101). In the 20th century, gill nets were used for taking trout. Tyonek residents report that during the 1940s they operated a fish trap in the outlet of the lake at the head of Little Jack Slough. Red salmon, rainbow trout, and Dolly Varden were harvested in this trap.

Regulations

During the study period, subsistence fishing regulations for the Cook Inlet area prohibited the taking of trout, grayling, char, and burbot for subsistence purposes in freshwater. However, other freshwater species such as whitefish (which are uncommon around Tyonek) could be taken in freshwater under the authority of a subsistence fishing permit (ADF&G 1983e:34,36). Subsistence fishing through the ice with hook and line was also prohibited (ADF&G 1983e:10). Consequently, there was no legal subsistence freshwater fishery in the Tyonek area. Tyonek residents were required to abide by sport fishing regulations while fishing with hook and line for freshwater fish. Those regulations

(ADF&G 1983c:18-21) provided a variety of open season dates depending on geographic location. Trout, char, Dolly Varden, grayling, and lake trout could be taken year round, but each had different possession and bag limits. Rainbow trout and steelhead limits were five per day and five in possession with only one fish over 20 inches allowed. Dolly Varden and grayling had a ten per day, ten in possession limit with no size limit. Lake trout (not harvested in Tyonek's resource area) were limited to two per day and in possession for fish 20 inches or more in length while those less than 20 inches had a limit of ten per day and in possession. Other freshwater species had no bag, possession, or size limits.

Harvest and Use Patterns

Tyonek residents harvested the majority of their freshwater fish during the winter months by fishing through the ice with rod and reel. Several men of the village travelled together to the mouth of Nikolai Creek with pick up trucks and snow machines during the winter months. There they drilled holes through the ice and fished for rainbows and Dollies. Rainbow trout and Dolly Varden were also harvested from the local creeks and lakes during the summer months by children (Fig. 38). During 1983, 11 percent of Tyonek households harvested an estimated 169 Dolly Varden. During the same year 13 percent harvested an estimated 194 rainbow trout. The harvest of rainbow trout and Dolly Varden was sometimes associated with other activities such as rod and reel salmon fishing and moose hunting.



Because the daily bag limits for freshwater fish were low, trout were usually not preserved for later use but instead were eaten fresh. Distribution was limited due to relatively small harvests.

Another species which was once harvested more intensely (Osgood 1937:30) but now only occasionally is Pacific tomcod. Tomcod are found in the saltwater but migrate into freshwater streams to spawn during late fall. Occasionally tomcod were taken with hook and line at the mouth of the Chuitna River and Old Tyonek Creek in October and November. During 1983 only a few were harvested by one household. Tomcod were cleaned and then fried or baked similar to hooligan. Sometimes a batter or coating of flour was applied to each fish prior to cooking.

SHELLFISH

The historical harvest and use of shellfish by Cook Inlet Athapaskans has been described in their oral traditions and documented by Osgood (1937:31-43). Clams and other kinds of shellfish were important in the trade between villages of the Upper and Lower Cook Inlet. Residents of Tyonek and Kustatan journeyed as far south as Kamishak Bay for clams.

In the 1920s, many Alaskan Native people, including those of Cook Inlet, participated in a commercial clamming operation during the spring at Polly Creek. Kalifornsky (1977:2-6) described clam harvests during the 1920s and concurrent subsistence activities such as hunting for seal, black bear, and porcupine. During this same decade, most Dena'ina from the western shore of Lower Cook Inlet moved north to the village of Tyonek. They, their children, and their grandchildren along with other

Tyonek residents, have continued to harvest razor clams (<u>qiz'in</u>), surf clams (<u>chuq'ush</u>) (sometimes called butter clams by local residents), and cockles (<u>esdghuga</u>) at traditional places along the southwestern shore of Cook Inlet (Stanek, Fall, and Foster 1982; Chickalusion and Chickalusion 1979:11-23; Kari 1977).

Regulations

During the study period, shellfish harvested for subsistence purposes were regulated under Subsistence Shellfish Regulations (ADF&C 1983e:48-51,54). Only persons domiciled in Tyonek were allowed to take clams for subsistence purposes from the terminus of the Drift River to the terminus of the Crescent River. There were no possession limits, season dates, or permitting requirements in effect.

Harvest and Use Patterns

From 1978-1984, shellfish harvests by Tyonek residents mostly consisted of razor clams with smaller quantities of cockles and Alaskan surf clams. Each spring and summer groups of Tyonek residents traveled by dory approximately 100-150 miles round trip south to clam beds located immediately south of the Drift River to Harriet Point, Polly Creek, and the Crescent River (Fig. 39; Plates G,H,I). Clamming trips usually took place in April, May and June during periods of large minus tides; occasional trips occurred in late summer or early fall. Groups of people travelled in one to five dories equipped with outboard motors. Clamming parties sometimes attempted to harvest seal and belukha while




Plate G.





Plate H.

Plate I.

Digging razor clams, Harriet Point.

en-route to clamming areas. Trips normally lasted one to two days depending upon weather conditions, abundance of clams, and other resource harvest activities which were undertaken.

Clamming trips were organized by "clamming leaders," individuals who possessed exceptional knowledge and expertise in this activity. Clamming leaders were generally older, more experienced men who owned dories and outboard motors. Through interviews conducted in 1982, it was determined that there were six clamming leaders in Tyonek who organized and led clamming expeditions. The six leaders had been participating in clamming activities in Cook Inlet an for an average of 27 years. One man had harvested clams for over 60 years.

Persons consolidated around these clamming leaders who then directed the activities of the group on clamming trips. Leaders decided among themselves when to leave for the clam beds and who would accompany them. Each dory carried 5 to 7 people, usually relatives and friends of the clamming leader. Generally, clamming groups traveled with several boats, to provide assistance to each other in case of mechanical failures or accidents. Occassionally, the most experienced leaders made trips in one day.

Case Example F

The following example of a clamming trip which took place in 1982 illustrates the organization of clamming activities in Tyonek during the study period.

Near the end of May 1982, following the last subsistence salmon set net opening of the week, five clamming leaders and their households (Fig. 40) organized a two day trip to Redoubt Bay and Harriet Point to gather clams. Their families had prepared for several days, accumulating fuel, food, and equipment. In the late afternoon, all supplies were loaded into trucks at their village residences, hauled to their commercial fishing dories located near the fishcamps, and loaded aboard. The three dories were rigged with canvas canopies for protection from wind, rain and spray of saltwater. Major items needed for the trip included food, gasoline, clamming shovels and buckets, warm clothing, cooking equipment, rifles and shotguns, raingear, and sleeping bags. As the tide reached its high point in Beshta Bay, the boats were fully loaded and the group departed in order to take advantage of the outgoing waters. In calm waters, travel to clamming areas normally took $2\frac{1}{2}$ hours. On this trip, the only obstacles encountered were the tidal rips and rocks around the forelands. Often there were floating logs and other debris which had to be negotiated. The experienced boat operators and trip leaders were familiar with these problems and dealt with them accordingly. With the longer daylight hours of spring, the group travelled until late in the evening. Upon passing the Drift River oil terminal, leaders watched for distant, familiar landmarks. They arrived at the area well before low tide and anchored their boats to wait for low water. Under the tarpaulin canopies everyone slept for a few hours. Boat operators made sure the boats were securely anchored.

At 4 am the vast sandy flats were exposed and people got their buckets and shovels. This was the first of two locations for clamming during this trip. This area was the most northern location where beds of cockles could be found. The group walked to the edge of the receding tidal waters where cobble-size rocks covered in algae were being exposed. Among the cobbles lay the fist-size shells of cockles -- some were partly buried while others lay completely exposed. In three hours of picking the group filled three five gallon buckets. Everyone returned to the boats where breakfast had been cooked. After their meal they took a nap and waited for the incoming tide.

The clamming group awoke two hours later to the lapping of waves against the boats. Anchors were pulled and the group headed south toward Harriet Point. On the incoming currents of water several harbor seals bobbed past. One of the leaders picked up his rifle and chambered a shell -- the next two seals were out of range but one appeared in the distance coming straight at the boat. Seventy-five yards out the seal submerged. The boat continued its course south and everyone waited for the seal to reappear. Thirty seconds elapsed -no seal. When the seal reappeared it was 100 yards to the rear of the boat and too distant for a clean kill.





The high bluff at Harriet Point soon stood in front the party, and the boats came to a stop. They selected the right location according to landmarks on the shoreline and dropped their anchors. People and equipment were reorganized, and everyone relaxed in wait for low tide.

By mid afternoon when fingers of sand started appearing they began walking to general areas where they had seen signs of clams and had dug clams on previous trips. The small dimple pockets began appearing in the wet sand surface, indicating the presence of clams buried beneath. The oldest member of the party knelt down and forced his shovel into the sand next to a dimple. He removed one scoop of sand and again stuck in the shovel, this time on the opposite side of the dimple. As the scoop of sand was pulled away the neck (siphon) of a medium size clam disappeared into the muddy sand beneath. The digger repeated the process this time he was quick to grab the neck before the clam escaped. Carefully, he pulled the neck until a six inch clam emerged; it was placed in the bucket. Several miles of bolder-strewn sandbar were finally exposed and clammers spread out looking for signs of clams. As the plastic buckets where filled they were carried to the boat and emptied into the large drums. Saltwater was later poured into the drums to keep the clams fresh. If kept in saltwater and in a cool place clams can be kept alive for three to five days--this also removes any sand left in the siphons or shells.

Around mid-day the incoming tide began covering the area. Equipment, buckets of clams, and personal belongings were loaded into the boat. Everything in the boat was organized by the older leaders so the weight of the load was evenly distributed. When the waters were deep enough motors were started and the group returned to a fish camp at Beshta Bay where the boats were unloaded into trucks; everything was taken to the village.

As soon as the group arrived at their homes, buckets of clams were divided among group households. Children in the households were sent with bags of clams to other households (2, 3, 7, and 11 in Fig. 40). Other households were told that clams were available and that they could be picked up at household 13. All remaining households in Figure 40 received clams. A total of 750 clams were harvested on the trip, and were distributed among 18 households.

Most village residents ate clams fresh. Some preferred them raw; most liked them cooked in chowders or fried. Those households with a large supply of clams preserved them by canning and freezing. As noted previously, clams and salmon were foods eaten during Lent.

Survey results reported by Stanek, Fall, and Foster (1982) and field observations indicate that prior to 1981 the estimated quantity of unshucked razor clams harvested each year by Tyonek residents was 2,800 to 3,300. However, in 1981 an unusually low harvest of 1,056 clams occurred. Tyonek residents attributed this low harvest to the destruction of the clam beds at their most frequently used site near Little Jack Slough. Some Tyonek residents believed this was due to either an illegal commercial clamming operation which dredged the mud flats or cleanup attempts with heavy equipment of an oil spill from the Drift River Terminal in early 1981.

During 1982 and 1983, harvest locations shifted to beaches further south. Consequently, harvest levels increased to an estimated 3,000 clams in 1982 and 3,500 to 4,100 in 1983. Additional information on sharing of resources in the 1983 harvest surveys indicated that 27 households received clams from one to three households. Individual clam harvesters reported giving clams to as many as 20 different households.

MOOSE

Historically moose were hunted year round by the Upper Inlet Dena'ina (Osgood 1937:35-37), but especially from August through March (Fall 1981:186-88,195). Methods included shooting with bows and arrows and snaring. Reportedly, moose where rare in the Tyonek area prior to the 1940s (Fall 1981:195). Tyonek elders recall the first moose seen in the vicinity of Kustatan in the mid-1940s. They say the arrival of moose was related to a large burn which occurred in the Chakachamna Lake area in the 1930s. Historically, people living at Tyonek and Kustatan traded marine mammal products and fish for moose and caribou taken by the residents of Susitna River and Knik Arm villages.

From the 1930s up to 1958 some Tyonek residents had commercial fishing camps at Point Possession on the Kenai Peninsula; several people also fished in the commercial drift fleet. Following the fishing season, these individuals hunted moose around Point Possession and elsewhere on the Kenai Peninsula. Moose hunting in this area last occurred in 1964. During this same period, former residents of Susitna River villages then living in Tyonek continued in trap furbearers and hunt moose in the Susitna River Basin, such as along Kroto Creek and at Red Shirt and Nancy Lakes. Moose meat and hides were often smoked and dried at camps and transported back to Tyonek.

In 1983, moose numbers in the Tyonek area were estimated to range from 500 to 600 animals (Faro, pers. comm., 1983). Moose moved seasonally between between high tundra areas and low elevations of mixed spruce and birch forests and along riverine corridors. According to research conducted in by Alaska Department of Fish and Game (Faro 1984:10), local migrations occurred between April and September when cow and bull moose travelled to tundra areas for rutting and mating, and then returned to lower elevational winter range in late fall and winter.

Regulations

Historical and recent hunting patterns of Tyonek residents near the community have mostly coincided with these seasonal moose movements, although considerable variation has occurred in this hunting pattern as

well as in moose movements due largely to the effect of variable seasonal temperatures and snow depths. Usually, Tyonek hunters took a few moose in late August and September from hunting camps established along the McArthur, Chakachatna, and Middle River systems. Hunters recalled days when power boats were able to navigate a circuit up the Middle River, into the Chakachatna, and down the McArthur, a route impassable today because of changes in the river channels. Later winter hunts were conducted closer to the village, by which time moose had moved into the area. Snowshoes and dog teams aided in the hunting and transportation of the kills.

Past regulated hunting seasons generally coincided with this traditional hunting pattern from statehood until 1976 (Table 11). Up to 1976, regulations allowed an early hunt in August and September, and a second late hunt in November. Excessive moose harvests in Unit 16B, a consequence of hunting pressures from urban southcentral Alaska, led to a closure of the November season after 1975. In 1983 and 1984 a late season was reinstituted by regulation. Moose populations had grown, and residents reported that moose was a critical food source in the winter months, when moose were accessible and when cold temperatures could be used to preserve the meat. Thus, a goal of these regulatory changes was to reestablish a legal season for residents during the winter months in conformance with traditional hunting patterns in the area.

Harvest and Use Patterns

During the early 1960s, oil and gas exploration activities on the west side of Cook Inlet began opening up a system of roads and trails.

TABLE 11. SUMMARY OF GMU 16B MOOSE REGULATIONS, 1959-1985

Year	Season Date	<u>Bag Limit</u>
1959–1962	August 20-Septémber 20 (to 30th in 1960) November 1-November 30	One bull
1963-1972	Same	One moose; antlerless seasons with varying dates in Sept.& Nov.
1972-1973	August 20-November 30	One moose
1973-1974	August 20-September 30 November 1-November 30	One moose
1974-1975	August 20-September 30 November 1-November 20	One moose
1975-1976	September 1-September 20 November 1-November 10	One moose
1976-1983	September 1-September 30	One moose with antler- less moose taken Sept. l-Sept. 20
Fall 1983	September 1-September 30	One moose;antlerless moose-September 10-20
	November 1-15	One moose per house- hold by permit to Unit 16B residents only
January 1984	January 1-15 by emergency order	One moose; 16B residents south of Beluga River only
Fall 1984-1985	September 1-September 30	One moose; antlerless moose September 10-20
	January 1-January 31 Two week season by emergency order	One moose per hh by permit to residents of Unit 16B from Beluga River South

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More extensive road systems were developed by timber interests in the 1970s. Tyonek residents have since acquired trucks and all terrain vehicles and consequently made intensive use of this road system for hunting during the study period. In 1981, the majority of Tyonek hunters' effort was along the network of logging roads. The balance of hunting effort took place in the McArthur and Middle River systems which were reached with outboard-equipped dories. The extent of the area hunted (Fig. 41) included approximately 750 square miles with about 150 miles of roads, and 40 miles of rivers; lesser amounts of all terrain vehicle and snowmachine trails were also traveled.

Within this generalized hunting area, small sub-areas were definable based largely on transportation and access means, and indirectly on moose distribution and weather factors. Effort and harvest levels were generally greater in those areas readily accessible by road vehicles (Fig. 42, Table 12). For example, in 1981, Tyonek hunters spent approximately 287 man-days to harvest 13 moose in areas A and B in Figure 42, which were road accessible. About 160 man-days were spent hunting in areas C and D, which had no roads and were accessible in September only by boat. Two moose were harvested in those areas.

During the 1983-84 hunting season, areas hunted differed seasonally as some areas became inaccessible due to weather conditions (Fig. 43). For example, the McArthur River was accessible by boat in September but not in the November and January seasons. Non-road areas north of the village were reached by snowmachine during the November hunt. The area hunted in January contracted as moose moved from high ground and were generally accesible near to roads.









AREA *	HUNTING MAN-DAYS	NUMBER MOOSE HARVESTED	MAN-DAYS PER MOOSE
А	150.5	11	13.7
В	136.5	2	68.3
С	94.0	2	47.0
D	56.0	0	-
Totals	437.0	15	29.1

TABLE 12.	MOOSE	HUNTING	EFFOR	r and	HARVESTS	FOR	FOUR	HUNTING	AREAS
		01	7 40 T	YONEK	HUNTERS,	198	1		

* Areas correspond to those in Fig. 42.

Moose hunting activities in Tyonek during the study period can be classified according to the length of time hunters remained away from their primary residence. Typically, road hunts lasted less than a day. Short-term hunts generally took place near the village, where temporary overnight camps, village residences, or fish camps served as bases of activities. Longer hunts lasting up to two weeks occurred along the McArthur River system, accessed by boat, where tent camps were established for a week or more at a time. These long hunting trips included extended family units or several smaller hunting groups. In contrast, short hunting trips usually involved two to five people who may or may not have been related. These temporary partnerships sometimes linked different extended families in the village, which thereby pooled their labor in order to enhance their hunting success. Although both men and women hunted it was rare for women to harvest moose because they participated only occasionally in the hunts. More

commonly, women participated in the extended hunting trips primarily in helping to set up the camps, prepare meals, perform camp chores, and care for children.

Hunting methods varied depending upon the locality of the hunt. Whenever traveling on a road or a stream hunters searched for moose in their vicinity. Moving vehicles were occasionally stopped and a vantage point gained from which moose were spotted, sometimes with the aid of binoculars. Hunters normally had a designated hunting area in mind where they hunted on foot in search of moose. When hunting on foot partners spread out and either walked through the area or took up a stand from which they watched for moose. Hunters also used vocal calls or mechanical means to attract moose.

Once spotted, moose were shot with high-powered rifles, after the hunter decided whether that particular animal was suitable for harvest. Depending on the time of year and regulations hunters were careful to choose the right age, sex, and size of moose. Young bulls and cows were preferred over large old bulls. Once harvested, a moose was butchered and either taken back to camp or to the hunter's residence (Plates J and K). The harvest was divided among hunting partners, and further distribution and sharing of products took place in the village.

It was common for hunters to engage in a number of other resource harvesting activities while searching for moose. Small game hunting, freshwater fishing, and berry picking were the most common activities. When small game such as porcupine and spruce grouse were taken, they were usually prepared for meals at camps. Trout and silver salmon were also harvested and consumed at hunting camps. If picked in large enough



Plate J. Butchering moose rib cage in the field.



Plate K. Removing moose rib cage in the field.

quantities, berries were transported back to village residences. People hunting along the roads for less than a day brought any harvests of small game to back to the village.

According to Tyonek hunters, the number of moose killed during open seasons from September 1979 to January 1974 showed substantial variations (Table 13). This varibility was related largely to the availability of moose in Tyonek's hunting area at the time the season opened. Hunting effort was consistently high throughout the study period. Tyonek residents did not consider the 9 to 20 moose taken during September open seasons from 1979-1983 to be an adequate harvest for the village for a year. Additional moose may have been harvested in the winters of 1979-1982, and 15 were taken in open seasons in November 1983 and January 1984.

TABLE 13. TYONEK MOOSE HARVESTS, SEPTEMBER 1979 THROUGH JANUARY 1984*

 Season	Number of Moose	
Sept. 1979	20	
Sept. 1980	N/A	
Sept. 1981	15	
Sept. 1982	9	
Sept. 1983	14	
Nov. 1983	1	
Jan. 1984	14	

* Reported moose taken during open season.

Sharing moose meat and other parts of the animal among hunters and non-hunters was a highly significant aspect of the use of this resource in Tyonek during the study period. The large quantities of moose meat shared between households contributed significantly to the food of those receiving the resource. Of equal importance to the community were the social relationship that were expressed and reinforced through the sharing networks.

When moose were harvested in Tyonek, distribution of the meat was related to the size of the hunter's household, his household's capability for getting additional moose meat, the size of the group or unit of people with whom he had a sharing relationship, the perceived needs of other people in the community, the timing of the harvest, and a variety of social relationships he and his household had with other community members. As mentioned earlier, hunters either hunted with one partner or they hunted with a large group of people, usually relatives. Whenever a hunter harvested a moose, sharing usually began within the immediate hunting group in the field or at the home of the successful hunter. The amount of meat that each of these people or households received was often redistributed to additional households. Usually, members of distribution network did not receive equal quantities of meat, nor did they receive enough from a single kill to meet all their annual needs. In some cases, households which harvested a moose did not retain all the meat they estimated they would need for the winter because of their obligations to provide other village households with large portions of their harvests.

In order to understand the extent of resource sharing in Tyonek, moose hunters and other households were interviewed in 1981 about

sharing networks in which they were involved, either as harvesters or as recipients of resources. The following case studies illustrate the kinds of sharing networks that existed in Tyonek during the study period.

Case Example G

This is an example of an extensive network (Fig. 44), which include eight related households and 29 people for the distribution of moose in 1981. All resources harvested by members of this group were brought to the hunters' mother's household (Number 7) before they were distributed to other households. When a moose was harvested in 1981 by one of the sons, the entire animal was transported to his mother's household where it was butchered. Because it was the first moose of the season only small portions of meat went to each household. Subsequent harvests by other households in this group were also distributed and all households received portions of each moose.

Case Example H

In the fall of 1981 the group of four brothers and their families in (Figure 45) travelled by dory to the McArthur River. After one week the brother in household 1 shot a moose. Because of warm weather and flies the group decided to return immediately home to prevent spoilage of the meat. The butchered animal was taken to the hunter's home where the meat was divided among the four brothers according to the size of each household. Each brother received either a front shoulder or a hind quarter while the remaining meat was divided into thirds among the three brothers with families. The internal organs were cooked fresh and the four families shared the meal together.

Case Example I

The group of households shown in Figure 46, totalling nine people harvested two moose in 1981. After 12 consecutive days of hunting the road systems from Tyonek to Mt. McArthur, a young man and his father's brother harvested a moose. They divided the kill equally between themselves. Each hunter kept some of his half for his own household while distributing a significant amount to other village residents. The uncle shared his half of the moose with his other brother and family. The nephew gave meat to his father, brother, and two village elders who live together. One of these elders is considered by many Tyonek people as "grandfather" (Chada). It is because of this fictive kinship relationship that this



Figure 44. The distribution of moose meat in Case Example G.



Figure 45. The distribution of moose meat in Case Example H.



Figure 46. The distribution of moose meat in Case Example I.

man receives resources from village hunters. This moose was shared among five different households totalling nine people.

Many other distribution networks, some more extensive and some less than those described, were operative in Tyonek during the study period.

These networks were dynamic and changed during the study period as households grew in size and as people aged.

The redistribution of resources assured that non-harvesting households received at least some moose meat for their food supplies . Some community members, especially elderly people, were part of several different networks and much of their annual meat and fish supply was provided either directly by receiving a portion of a harvest or indirectly through meal sharing with other households.

In addition to network systems, moose meat like other resources, was shared at social events such as potlatches, weddings, and funerals. Meal sharing was an important means of receiving resources, especially for single and elderly community members. In a survey of 100 percent of Tyonek households conducted during early 1984, 75 percent said they received moose meat from at least one other household during the 12 preceding months.

Moose meat was usually hung in a cool place for several days of aging. Some households hung moose meat in their smokehouses and applied a cold smoke to enhance the flavor of the meat. In a household survey conducted in 1983, 43.7 percent reported that freezing in a freezer was the method used to preserve moose meat (Fig. 47). The second most common preservation method was canning, used by 8.7 percent of the households. A small percentage of people only smoked or dried the meat and froze it outdoors. About one-fourth of Tyonek households consumed



Figure 47. Methods of moose meat preservation used by Tyonek households during 1983.

at least some of their moose meat fresh. Sixteen percent reported not preserving moose.

BEAR

Black bear and brown bear are quite numerous in the Tyonek area. Bear were often sighted at the local dump and along the extensive road system during the study period. Both black and brown bear have been found to be significant predators on moose in the Tyonek/Beluga area (Faro 1984:20).

Regulations

During the study period regulations governing the taking of black bear in GMU 16-16B (ADF&G 1973a:34) were relatively liberal with no closed season and an annual bag limit of three bears. Brown bear regulations were more restrictive with a split season running from September 1 to October 31 and from May 10 to May 25 and a bag limit of one bear every four regulatory years per license holder.

Harvest and Use Patterns

During the study period, the general feeling in Tyonek about the use of black bears was that any young bear that was harvested in the fall and which had been up high feeding on berries was edible. Black bears which had been feeding in the village dump or on salmon were not considered fit for human food. During 1983, there were two households who unsuccessfully hunted black bear. These hunters searched for black bear while moose hunting, but did not locate any bears.

Although brown bears were harvested for food at Tyonek into the 1950s, today they are no longer regarded as a food source by most villagers. Also, during the study period, Tyonek residents showed no interest in taking bears for trophies or rugs.

The area used for hunting bears is depicted in Figure 41. The area is identical to that used for moose and small game, because harvests of bear were most often incidental to these other activities. Several black and brown bears were shot during the study period as nuisance animals which were causing or attempting to cause destruction of property or posing a threat to human life. These events usually occurred around fishcamps and smokehouses, but on one occasion a brown bear was killed while it was digging in the village cemetery within view of village homes.

SMALL GAME

Species of small game harvested by residents of Tyonek during the study period included spruce grouse, ptarmigan, snowshoe hare, and porcupine. Spruce grouse and porcupine were incidentally harvested during moose hunting and travel along logging roads. Ptarmigan were harvested during years of heavy snow accumulation when the birds migrated to lower elevations and became accessible to hunters by snowmachine or snowshoes. The snowshoe hare population was low for the past several years in the Tyonek area during the study period and very little harvest effort was directed toward them.

Regulations

The following regulations covered the harvest of small game in GMU 16 during the study period (ADF&G 1983a). Grouse and ptarmigan seasons extended from August 10 to April 30. Bag and possession limits were liberal and included 15 per day, and 30 in possession for grouse; and 20 per day, 40 in possession for ptarmigan. Porcupine and hare had no closed seasons and no bag or possession limits.

Harvest and Use Patterns

From 1983 through January 1984, 26 percent of Tyonek households hunted grouse, harvesting an estimated 79 birds; 17 percent of the households attempted to harvest porcupine, with 14 animals taken; and 14 percent of the households hunted ptarmigan, taking approximately 46 birds. No households reported harvesting hare in 1983 (Table 8). Areas used for hunting small game are depicted in Figure 41.

Distribution and sharing of these species was not extensive because of the small harvest quantities. Most small game animals were eaten fresh, either at village residences or at hunting camps. The harvests were prepared by baking or roasting. Porcupine were plucked and then singed to remove under-fur before cooking.

WATERFOWL

Traditionally, migratory waterfowl were taken in Upper Cook Inlet from their arrival in spring through September (Osgood 1937:40).

Methods of capture included snares, slingshots, and bows and blunt arrows. During 1930-40s residents of Susitna Station who later resided in Tyonek, traveled downriver to the mouth of the Susitna River to harvest waterfowl. Annual spring and fall harvests occurred. Spring harvests consisted of many varieties of ducks, geese, swans, and gulls.

Regulations

Since 1918 by international treaty, spring waterfowl hunting has been prohibited in Alaska. During the study period, the U.S. Fish and Wildlife Service established general guidelines for waterfowl harvest within which state regulations were based. Season dates in the study area extended from September 1 to December 16 with bag limits on ducks other than sea ducks at eight per day with 24 in possession. Sea ducks, which includes eiders, scooters, old squaw, harlequin, and mergansers had limits of 15 per day and 30 in possession. Geese could be hunted during the same season as ducks but had different bag limits. A total of 12 geese could be in possession, except that no more than four canada geese and white-fronted geese could be taken daily with a maximum of eight in possession (ADF&G 1983a:62-63). In addition to the above restrictions, hunters were required to have a federal migratory bird hunting stamp.

Harvest and Use Patterns

Ducks, including mallards, pintails, widgeons, and goldeneyes, and Canada geese were harvested by residents of Tyonek during the study

period 1978-84. The areas typically used to harvest waterfowl were the tidal areas from Chuitna River to the mouth of the Susitna River, and the Trading Bay area from Nikolai Creek to West Foreland. Hunting occurred along the tidal areas and the rivers and creeks which flow into these areas. The major hunting areas were the mouths of Nikolai Creek, Middle River, and McArthur River (Fig. 41).

During 1983, 49 percent of Tyonek households attempted to harvest ducks resulting in a harvest of 241 birds. Forty-five percent attempted to harvest geese with a total of ten geese taken.

Harvest during the fall usually was planned in conjunction with moose hunting, marine mammal hunting, and clam digging. After moose season or after the household had harvested a moose, and if the birds had not migrated from the area, special hunting trips were taken specifically for waterfowl.

To a minor extent during the study period, a spring harvest of waterfowl occurred in the Trading Bay area. Tyonek hunters were interested in having a legally regulated, traditional spring subsistence hunting season.

Waterfowl were shared within the village to a more limited extent than salmon and moose. This may be related to the relatively small numbers harvested and the high monetary expenses involved in harvesting waterfowl. Waterfowl were generally considered to be a special treat and were consumed within the households of the successful hunters. In addition, village elders usually received gifts of a few ducks from successful hunters.

Birds were usually not stored but eaten fresh. On occasion a goose or several ducks were frozen to be prepared on a special day or holiday.

Also, many of the birds were used at moose hunting camps. Waterfowl dishes were prepared by baking or roasting. Waterfowl were also used in soups.

FURBEARERS

Furbearers that were fairly common in the local area from 1978 to 1984 included beaver, red fox, land otter, marten, mink, and weasel. Also occurring were relatively low populations of muskrat, wolf, wolverine, lynx, and coyote.

As described in the historical section, trapping of furbearers was a very important source of cash for residents of Tyonek from 1920 to about 1958. During that time period almost every healthy adult male had an established trapline. These trapping areas extended from Kroto Creek to the Kustatan River. Beaver, mink, land otter, and marten comprised the bulk of the catch with a few wolverine, fox, wolf, muskrat, and lynx harvested every year.

Regulations

Unit 16 B regulations allowed the trapping of red fox from November 10 to February 15, with no limit and beaver from November 10 to April 15, with a limit of 40 per season. Beaver could not be taken by any means other than steel traps or snares in GMU16 (ADF&G 1983b:12). See Table 14 for the regulations governing the trapping of these and other furbearers in GMU 16B.

TABLE 14.TRAPPING REGULATIONS FOR GMU16JULY 1, 1983 - JUNE 30, 1984

Species	Open Season	Bag Limit
Beaver	Nov. 10 - April 15	40 per season
Coyote	Nov. 10 - March 31	No Limit
Fox (red, cross, black, or silver)	Nov. 10 - Nov. 15	No Limit
Lynx	Nov. 10 - March 31	No Limit
Marten	Nov. 10 - Feb. 28	No Limit
Mink and Weasel	Nov. 10 - Jan. 31	No Limit
Muskrat	Nov. 10 - June 10	No Limit
Otter, Land	Nov. 10 - March 31	No Limit
Squirrel (red, flying, parka, or ground)	No Closed Season	No Limit
Marmot	No Closed Season	No Limit
Wolf	Nov. 10 - March 31	No Limit
Wolverine	Nov. 10 - March 31	No Limit

Source: Alaska Department of Fish and Game 1983b.

Harvest and Use Patterns

During the study period, trapping effort by village residents was low. Reasons village residents gave for this low effort included low market values which discouraged trapping in the 1960s and 1970s, increased commercial fishing revenue, the high expense of running trap lines for uncertain returns, and the availability of alternate sources of cash. Many village households enjoyed eating beaver meat, and beaver were harvested for their meat as well as for their pelts. Beaver meat was usually prepared during festive occasions and potlatches.

In the past, beaver were shot with rifles during moose hunting, but this practice was prohibited by regulation during the study period. Of the furbearer species available in the area, two red fox and 25 beaver were harvested during 1983 by 5 trappers. The areas used for harvesting furbearers are depicted in Figure 36.

MARINE MAMMALS

Belukha and harbor seal arrive near Tyonek during early May. They remain in Upper Cook Inlet throughout the summer and fall, returning to Lower Cook Inlet during November. While in the Upper Inlet belukha and seal usually frequent the mouths of rivers and creeks and sometimes ascend the largest streams such as Beluga and Susitna rivers. While in the Upper Inlet, belukha and seal feed on salmon, hooligan, and tomcod which are then approaching freshwater drainages to spawn. Population estimates for belukha in Upper Cook Inlet were 400-500 animals in 1984 (Lowry 1984; Klinkart 1966).
Historical Hunting Activities

During the 1930-60s, several living Tyonek residents participated in the federal bounty program on seals in Cook Inlet. Seals were harvested for the bounty paid by the federal government, for the sale of the hide, and as a food source. Bounties paid on seal ended in 1967 (Pitcher, pers. comm., 1984). Most of the harvest of seals occurred near Kalgin Island and several freshwater sloughs in Redoubt Bay. Several methods of harvest were used. On the Kalgin Island mud shoals during 1928-40, a four foot long wooden root shaped like a modern hockey stick was used to club seal. The hunter removed his clothing and boots so as not to get mired in the mud. He then ran through group of basking seals during low tide. As he ran past a seal, he struck it on the forehead with the club. Many were clubbed in this manner. Reportedly, the hunter kept running, for if he stopped, the seals behing him attempted to bite! After the remaining live seals had moved away from the clubbed ones, a small hole was cut through the hide into the stomach cavity of each seal. Air was then blown into the cavity and the hole tied shut. Another hole was cut through the bottom jaw of each seal. All the seals were then threaded on a rope before the tide came in. As the water flooded the shoal the carcasses floated, and were retrieved and butchered one at a time from a boat. The meat was saved to be dried and eaten later, the scalp turned in for the bounty, the hide stretched for sale, and the fat rendered into oil.

Another method of harvesting seal was calling and shooting them in small creeks or sloughs which flow into Cook Inlet. Down wind of the slough, the hunters dug a hole along the bank, for concealment. They

shot and killed the first seal that came up the slough as it flooded with the incoming tide. The hunters placed the dead seal in front of the hole to hide behind it. Reportedly, if the first "lookout" seal was not killed and returned to the Inlet, no other seals would enter the slough during that tide. To attract more seals after harvesting the first, one hunter waved the dead seal's flipper and called similar to a seal. The other hunter shot any curious seal which came close. All the harvested seals were placed as decoys on the bank in basking positions to indicate safety to the remaining seals. When enough were harvested, the seals were cut up on the bank and the products transported to the village by boat.

Information from Tyonek households indicates that during the 1930s a commercial belukha processing operation run by non-local businesses, was located near the mouth of the Beluga River. Belukha were harvested there and the blubber was rendered into oil for sale in Anchorage. Belukha entered the Beluga River during high tide pursuing salmon and hooligan. Once the belukha were in the river a large strong net was pulled across the outlet. With the ebb tide, the belukha were left stranded. As many as 30 belukha were caught during one tidal change.

Prior to 1940, marine mammals were a major source of food for the residents of Tyonek. Both the meat and blubber were used. One elder estimated that as many as 6-7 belukha were harvested per year during the 1930s and early 1940s. Since the 1940s, village elders report that there has been a shift in hunting effort from marine mammals to moose, for during this period moose populations have increased in locally accessible areas.

Regulations

During the study period, harbor seals and belukha were managed by the U.S. Fish and Wildlife Service under the authority of the Federal Marine Mammal Protection Act of 1976. According to the provisions of that act, only Alaska Natives may take marine mammals for subsistence uses. Other than that restriction, harvesting of seal and belukha in Cook Inlet was not limited by seasons, bag limits, or methods.

Harvest Levels and Methods

Recently, there has been renewed interest in harvesting belukha by Tyonek residents and participation in the hunting marine mammals has been increasing. About three belukha were taken in 1979 by hunters from Tyonek, and from 1981 through 1983, one belukha was harvested each year. In 1981 five belukha were struck (shot) and one was retrieved, with 20 Tyonek residents participating in 6 outings. In 1982, three belukha were wounded with one recovered, and approximately 20 residents participated in three hunts. During 1983, eight (11 percent) Tyonek households attempted to harvest belukha. One belukha was harvested in mid June near the Beluga River and transported to the village. Hunters also attempted to harvest seal during 1981-1983 with no success.

During 1978-83, Tyonek residents hunted belukha and harbor seal along the shoreline areas of Cook Inlet (Fig. 39) north of the village to the Susitna River. The Beluga River and Theodore River were major hunting areas. South of Tyonek, marine mammal hunting occurred as far as the McArthur River in association with other activities such as

waterfowl hunting, moose hunting, and commercial and subsistence fishing. The harvest area for seal extended beyond the McArthur River to Harriet Point and was associated with the harvest of razor clams in Redoubt Bay.

Methods used during the study period to harvest belukha for personal consumption differed markedly from those used historically, as described in Chapter 2. Hunters lay in wait along the banks of the rivers in an outboard motor driven boat until belukha entered the shallow river, or arrived at the mouth of a river after the animals had already entered. Once a belukha was located, the boat was maneuvered into position, cutting off escape to deeper water. As the belukha breached, hunting partners in the bow of the boat shot it with high powered rifles. In order to prevent the animal from sinking, hunters attempted to quickly loop a rope around the tail, or attempted to gaff the animal until a rope was secured through the lower jaw and upper lip (Plate L). The belukha was then towed to shore. Alternately, the belukha was lashed along the side of the boat by one flipper and tail to be towed to the village.

To take seal, hunters attempted to shoot them in the head when they surfaced. Once shot quick recovery was required since these animals only float for a few minutes before sinking in the murky waters of Upper Cook Inlet.

Processing Belukha

After a belukha was harvested, it was towed intact along side or behind the boat to the beach near the village, then pulled partially up



Plate L. Harvested belukha towed to beach at Tyonek.

the gravel beach with a motorized vehicle to the butchering site. An older village man directed the hunters and villagers during the butchering process (Plate M).

The flippers and tail were removed and discarded. The skin and blubber were removed by making parallel cuts the length of the carcass about 16 inches apart. As these strips of blubber were fleshed from the animal they were cut into blocks approximately 24" in length. After the blubber was removed exposing the flesh, the backstraps were cut from the backbone. The ribs with the meat remaining on them were then separated from the backbone, exposing the internal organs. The liver, heart, and inner tenderloins were then removed. The remaining skeleton and internal organs were either used for dog food or returned to the inlet. The blubber and meat were cut into smaller portions and shared throughout the village.

Distribution and Sharing of Belukha Products

When a belukha was harvested, word spread through the village. A large group assembled to aid in the butchering process on the beach. When the butchering ended, everyone was invited to take a portion of the blubber and meat. Portions were transported throughout the village and distributed to the elderly and to families who were not on the beach during processing. During 1983, 36 percent of Tyonek households received a portion of that year's belukha.

The meat was roasted, boiled, or ground into burger, while the blubber was usually rendered into oil. Also, strips of blubber attached to skin were boiled and served as a main course.



Plate M. Butchering belukha on the beach, Tyonek.

PLANTS AND WOOD

Plants harvested by Tyonek residents included high-bush cranberry, low-bush cranberry, high-bush blueberry, low-bush blueberry, salmonberry, crowberry, labrador tea, rosehips, white spruce, paper birch, cottonwood, alder, shelf fungus, and wild celery. There were also several other plants used for medicinal purposes including wormwood (<u>t'selbeni</u>) and angelica (<u>u1chena ggits'a</u>). The reader should consult P. Kari (1977) for a detailed discussion of historical and contemporary Dena'ina use of plants.

In 1983, 64 percent of Tyonek households harvested edible plants totalling about 833 quarts for the entire community. This figure does not include shelf fungus. Usually, berries and rosehips were harvested during day outings by family groups comprised mostly of women and children. Access to plant harvesting areas (Fig. 37) was by pickup truck along the local network of logging roads.

Berries and rosehips were eaten fresh or preserved in jellies and jams. Labrador tea leaves were brewed for tea and used as a cure for sore throats. Wild celery was peeled and eaten raw.

Sixty percent of the village households harvested 142 cords of wood during 1983-84. Trees were used in a variety of ways. Spruce and birch were used for heating homes. About 56 percent of the homes and 100 percent of the fishcamps had some type of wood burning stove. Birch, cottonwood, and alder were used in smokehouses to provide smoke and heat for drying salmon. Spruce provided fuel in steambath houses. Spruce was also harvested by the village employees and cut into lumber at the village sawmill. The lumber was sold to village residents as building

materials. Small diameter spruce drying poles were used in smokehouses on which to hang salmon.

Shelf fungus (<u>Ich'ish</u>) were collected, burned, and the ashes used as an ingredient in homemade snuff. Several individuals in the village prepared this product for sale to other residents.

COAL

Outcroppings of coal are scattered along the beach up against the bluff from Tyonek Creek to Granite Point (Fig. 38), the area where most of the Tyonek fishcamps were located. There were 20-25 active camps in which coal was used as a source of cooking or heating.

Coal was harvested by collecting the smaller pieces or breaking off larger ones with a sledgehammer. The coal was then transported by pickup truck to the fishcamps. An estimated 954 five gallon buckets of coal were collected from the beach by 26 percent of the households in 1983. On occasion during rainy periods pieces of coal were added to the smokehouse fire. The coal, once ignited, burned longer and hotter than wood and thus prevented mold from starting to form on the fish during damp weather. One household smoked their fish entirely with coal.

CHAPTER 7

DISCUSSION

TYONEK'S ECONOMY AND REGIONAL CHANGE

Since the arrival of the first European explorers in the late 18th century, the Cook Inlet region, a homeland of the Dena'ina, has been subject to intensive economic, social, and cultural changes. It was the location of some of the first Russian settlements in Alaska, a focus of the early fur trade, and subject to depleted salmon and game populations in the early 20th century. Since the Second World War, the Cook Inlet region, and especially the Kenai Peninsula, Anchorage, and the Matanuska Valley, has been Alaska's most dynamic and fastest growing region, largely as a result of oil and gas development. The region's population was about 220,000 in 1980, almost half of the state's total.

On the northwestern shore of Cook Inlet, Tyonek, with a population of 273, in 1983, was the largest and least accessible Dena'ina village remaining in the region. As this report has documented, in 1983 the residents of the community of Tyonek participated in a mixed economy based upon commercial fishing, seasonal wage employment, other sources of cash, and the harvesting of fish, game, and plant resources for local use. The local economy was food extractive: harvesting fish and game provided the material and social basis for the continued existence of the community. These types of economic systems have evolved in Alaska as rural communities have integrated the use of cash into traditional patterns of resource harvest (Wolfe 1982). Features of mixed-subsistence based economic systems include: traditional systems of land use

and occupancy; a seasonal round of production activities; high levels of production and participation in resource uses; a domestic mode of production; and networks of distribution and exchange (Wolfe 1982:252-267). In Tyonek, cash incomes were well below the state's average. Households and extended family groups harvested large quantities of salmon and moose. Marine mammal hunting, shellfish gathering, waterfowl hunting, small game hunting, freshwater fishing, hooligan fishing, and plant gathering were common activities for many households. In combination these harvests contributed substantially to the village food supply. In addition, fish and game harvesting and processing provided social contexts for the expression of extended kinship ties, the sharing of resources, and the transmission of traditional values to the community's young people.

Although peripheral to much of the economic development taking place on the Kenai Peninsula, Anchorage, and the Matanuska Valley, Tyonek has not been isolated from the effects of rapid regional population growth, environmental change, industrial development, and the introduction of industrial-capital property and legal systems. In fact, Tyonek has been subject to many of the environmental and socioeconomic conditions which have transformed much of the state for a longer period of time, and perhaps more intensively, than most Alaskan rural communities. It is thus instructive to examine the patterns of resource use in Tyonek in the late 1970s and early 1980s in light of the changes that have taken place, both within the community, and in the regional socioeconomic system. The sections that follow are organized around the characteristics of a subsistence-based mixed economy, as outlined above.

LAND USE AND OCCUPANCY

In the 18th and 19th centuries, the <u>Tubughna</u>, aboriginal residents of the Tyonek area, who are ancestral to much of Tyonek's current population, used land from the mouth of the Susitna River south to the McArthur River, and inland across the mountains to Chakachamna Lake and Rainy Pass. This use area expanded in the early 20th century as residents of abandoned villages such as Kustatan and Susitna Station moved to Tyonek but continued to travel seasonally to hunting and fishing areas near their former homes. Commercial fishing and clamming activities encouraged subsistence harvesting on the Kenai Peninsula and Polly Creek.

In the late 1970s and 1980s, the marine mammal hunting, fishing, and gathering areas of Tyonek residents extended along a long stretch of coast from the Susitna River south to Tuxedni Bay, equal to or greater than that of aboriginal times. Inland hunting and gathering areas included up to 750 square miles, mostly from the Chuitna River south to the McArthur River, and from the coast to the base of the Alaska Range. This represents a loss of territory to the north. Tyonek residents report that they ceased regularly using the lands north of their reserve in the 1950s and later as homesteaders moved in to these areas. According to Tyonek residents, there was a tacit agreement with these newcomers that lands to the south of the Chuitna River were for use by Tyonek residents. During the study period, Tyonek hunters viewed the McArthur, Middle, and Chakachatna River drainages, as well as former reserve lands, as the hunting territory of the village. Within this

area, family or individual hunting territories evidently did not exist. The use of the mountainous area to the west of the village and the Chakachamna Lake area declined as fur trapping became less important and people remained in the village throughout the winter because of children attending school.

More recently, regional resource development activities have modified Tyonek residents' patterns of land use. A local road network, mostly on village and state lands, was constructed in the 1960s and 1970s to facilitate oil and gas exploration and development and timber harvesting. These roads began to be used by Tyonek residents, as well as hunters from other areas, for resource harvesting activities, especially moose hunting.

In 1983, traditional usufruct rights governed the use of fishing sites and fish camps in the village. All camps and sites were within the boundaries of the former village reserve. As noted, fish camps were said to be "owned" by particular individuals or families, who had constructed shelters and processing facilities there. Camps were bought and sold. However, abandoned camps were sometimes restored and acquired by new "owners." Owners commonly granted use privileges to other village households. Households without fishcamps often fished on the stretch of beach directly below the village where a usufruct system also was in effect during the fishing season. Fishermen were aware of where others set nets during the season and generally selected vacant areas for their own fishing.

During the study period, it was extremely rare for Tyonek residents to travel to other parts of the state, or even outside the recognized village "territory" to hunt and fish. There was some visiting and

exchange of products from other regions with relatives and friends living outside the village, in Anchorage, Eklutna, and Kenai, for example.

SEASONAL ROUND

The seasonal round of resource harvests, as depicted in Figure 13, resembles in several ways the aboriginal cycle of resource activities in Tyonek as recounted in oral traditions and historical sources. During the study period, the residents of Tyonek were still very much "the beach people," orienting many of the most common and productive harvesting activities along the shore of the Cook Inlet. The beach and adjacent waters also served as transportation corridors to moose hunting and waterfowl hunting areas. The seasonal cycle was highly patterned, in that during the study period households and families regularly participated in the same activities each year. This scheduling was closely associated with seasonal cycles of resource availability, as they were in the past. For most households, wage employment was subordinate to hunting, fishing, and gathering activities, in that people commonly took substantial blocks of time off from work to hunt and fish.

One of the most significant factors modifying the seasonal patterns of fish and game harvests in Tyonek has been the regulatory system established first by the federal and territorial governments and, after 1959, primarily by the state (see Chapters 5 and 6). Regulatory decisions of major significance have included the 16 year closure of king salmon subsistence fishing between 1964 and 1980; the prohibition against spring waterfowl hunting since 1918; the restriction of moose

hunting to September for most of the last ten years; and the reduction of possession limits on most species. More subtle in their effects have been such regulations as the prohibition against subsistence fishing in fresh water, including fishing through the ice, and the restriction against shooting beaver.

The major regulatory changes just mentioned were, of course, imposed largely as resource conservation measures. However, the environmental conditions that led to such restrictive rules were the consequence of hunting and fishing pressures brought about by a growing regional population in the Cook Inlet drainage and by commercial fishing in Cook Inlet, and not the resource uses of the village of Tyonek. Thus, these regulations resulting from that the conditions created by regional demographic growth and ecological change have a direct effect on communities which rely on local fish and game populations for subsistence uses. The long-range effects of such conditions can mean disruption of the transmission of traditional knowledge, as in the case of king salmon, where children did not learn processing skills when the season was closed for 16 years; illegal hunting activities, as in the case of winter moose and king salmon fishing from 1964-1980; or the virtual elimination of traditional activities, as in spring waterfowl hunting, banned since 1918. Clearly, without environmental protection and regulatory accomodations, communities such as Tyonek may experience many negative consequences of regional commercial and industrial development.

During the current study period, most Tyonek households participated in the harvest of fish and game resources. As noted in Chapter 5, over 82 percent of Tyonek's households harvested salmon, 69 percent hunted moose, and 64 percent gathered berries and other plants. These high participation rates for these resource categories were most likely related to the relatively high productivity of these activities and the high accessibility of the resources to most households. For example, harvesting salmon required only a low monetary investment for equipment, transportation, and processing supplies. Even households without means could borrow harvesting equipment and contribute their labor to the other fishing groups in exchange for supplies and transportation. While cash requirements were low, harvesting kings required a substantial investment of time to process the catch. Labor was usually supplied by members of a kinship group. With a limit of 70 kings (about 1,250 pounds edible weight) each household could procure a large portion of the family's annual food supply.

Moose hunting required a larger monetary investment in transportation costs and equipment, and similarly, substantial amounts of time. The potential return was high, however, up to about 500 pounds of meat for a single moose. Another motive for moose hunting was social obligation. Involvement in resource sharing networks obligated people to hunt and fish in order to reciprocate for past gifts of fish and game.

Plant gathering did not supply large amounts of food, but it was an activity in which most households and family members could take part.

Harvest areas were close to village homes, and expensive equipment was unnecessary. Thus, it was very popular.

In contrast, household participation rates in the harvest of several other resource categories were relatively lower. Resource availability, regulations, and procurement costs probably accounted for this. For example, small game was not abundant near Tyonek during the study period, and was mostly taken incidentally to other activities. Consequently, about 39 percent of the households hunted these resources in 1983-84, not an insubstantial percentage, but still less than salmon, moose, and plants. Only about 15 percent of the households harvested freshwater fish. There were few freshwater fish species available locally, and the relatively low bag limits (e.g. five per day for rainbow trout) and the restrictions on gear type under sport fishing regulations may have been responsible for this. Freshwater fish could not be taken by traditional gear such as nets, fishtraps, or fish spears. They could only be taken by rod and reel.

Clams were a favorite food in the village during the study period, consumed by 36 percent of the households. However, only a few families in the village harvested most of the clams, and then distributed them widely in the community. This was because of the distances involved in reaching the clam beds, the consequent large expenses for fuel, the need for expensive equipment such as dories and outboard motors, and the skills demanded to make the trip safely.

Hunting marine mammals appears to be a special case in the seasonal round of activities. As noted, belukha and harbor seal were major sources of food in Tyonek in the past. These resources, especially belukha, are still highly prized today, yet harvest levels dropped in

the 1950s, 1960s, and 1970s. Several factors may account for this. An alternate resource, moose, became available in the 1940s, one that required less travel and expense and was less likely to be lost or unretrievable. As a consequence of federal bounty programs and other introduced forms of commercial exploitation, marine mammals in Cook Inlet probably were less abundant in the mid twentieth century than earlier, again encouraging a shift in effort to other species. Marine mammal hunting, except as an incidental activity to clam harvesting and boat travel, became relatively expensive compared to salmon fishing and moose hunting. As noted, however, belukha hunting was regaining popularity in the village during the study period and at least one was taken every year. At least one third of the village received belukha products in 1983. It seems likely that marine mammal hunting will continue as a subsistence activity in the village, and possibly will increase.

COMPOSITION OF RESOURCE HARVESTS

Diversity of resource uses is a significant feature of mixed, subsistence-based socioeconomic systems in Alaska. As discussed in Chapter 2, Dena'ina oral traditions emphasized the diversity and richness of the resources harvested by the "beach people" of Tyonek.

Compared to the resource harvests of some Alaskan rural communities today, the composition of Tyonek's harvest as measured by edible weight appears relatively specialized. About 71 percent of the harvest was comprised of salmon, mostly kings, in 1983-84, and 21 percent was land mammals, almost all moose. The numerous other resource taken accounted

for only eight percent of the total harvest. As a comparison, the harvests of several Kodiak island villages such as Larsen Bay, Old Harbor, and Ouzinkie were distributed more evenly over several resource categories (Table 15). Mean household harvests in Larsen Bay in 1982-83, for example, contained 40 percent salmon, 16 percent other fish, 19 percent land mammals, 14 percent marine mammals, and 11 percent marine invertebrates. The subsistence harvest of the Yukon Delta community of Alakanak in 1980-81 was composed of 27 percent salmon, 38 percent other fish (at least eight species), 10 percent land mammals, 18 percent sea mammals (six species), and 7 percent waterfowl.

On the other hand, other rural communities displayed harvest compositions similar to Tyonek's. Nondalton household harvests for example, were composed of 69 percent salmon, mostly sockeye, in 1981, and 23 percent land mammals, mostly caribou and moose. Harvests in Karluk in 1982-83 were composed of 67 percent salmon, mostly sockeye. Salmon comprised 67 percent of the harvest in Klukwan in 1983, and 61 percent of the harvest in Chitina in the same year.

In short, the domination of one resource category, salmon, in Tyonek's annual harvest is not particularly unusual in comparison with some other communities located near productive salmon resources. The high value placed on salmon as a food source in the village, its accessibility, and the relatively low monetary costs of harvesting and processing, account for the finding that most household harvests were predominately salmon. Unfortunately, it is impossible to compare the composition of today's harvests with that of earlier times. However, it is certain from historic sources that salmon was taken in large amounts, and adequate supplies of salmon were the critical factor in winter

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TABLE

		•	Z Z	X X	X Marine	% MARINE Invert -		MEAN HOUSEHOLD	PER Capita	
	YEAR	SALMON	FISH	MAMMALS	MAMMALS	EBRATES	OTHER	HARVEST	HARVEST	Source
Southcentral Region	10.01_81		0 01	0.11	c	c	0	178	011	Stration & Georgette 198.
Chint to china	1982-83	37.0	0.8	43.0	• •	00	12.0	116	115	
Chiting	1982-83	61.0	4.0	28.0	0	0	7.0	342	061	:
Copper Center	1982-83	62.0	21.0	13.0	0	0	5.0	383	113	-
Glennallen	1982-83	44.0	10.0	42.0	0	0	4.0	227	11	
Gulkana	1982-83	49.0	14.0	33.0	0	•	5.0	333	111	Stratton & Georgette 198
Homer	19 82	15.0	34.0	27.0	0	22.0	2.0	287	103	Reed 1984
Kenaf	1982	40.0	26.0	17.0	•	13.0	4.0	127	38	
Nabesna Road	1982-83	28.0	23.0	47.0	0	0	2.0	1233	280	Stratton & Georgette 198
Nfnilchik	19 82	20.0	48.0	10.0	0	16.0	6 .0	261	87	Reed 1984
Seldovia	1982	33.0	22.0	15.0	0	15.0	15.0	190	54	=
Tyonek	19 83-84	71.0	3.0	21.0	1.0	2.0	2.0	796	272	
Kodiak Island										
Akh iok	1982-83	43.0	6.0	15.0	28.0	0.6		1975	518	KANA 1983
Karluk	19 82-83	67.0	10.0	0.11	10.0	2.0	,	3296	835	:
Larsen Bay	1982-83	40.0	16.0	19.0	14.0	11.0	•	1666	400	=
Old Harbor	1982-83	45.0	14.0	18.0	16.0	7.0	•	1758	464	-
Ouzinkie	1982-83	44.0	15.0	19.0	8.0	14.0	•	1197	358	= :
Port Lions	19 82-83	33.0	34.0	16.0	3.0	14.0	•	866	262	
Bristol Bay										
New Stuyahok	1983	50.0	10.0	32.0	0	0	8.0	5 088	896	Wolfe et al. 1984
Nondal ton	E7 61	63.1	5.0	29.1	•	0	2.8	4142	803	Behnke 1982
Nondal ton	19 80	80.3	2.6	16.4	•	0	۲.	4959	1036	-
Nondal ton	19 61	68.7	4.9	23.1	0	0	3.3	4195	738	:
Yukon-Kuskokwim										
Alakanak	19 80-81	27.0	38.0	10.0	18.0	0	7.0	4821	733	Wolfe 1981
Emeou ak	19 80-81	37.0	33.0	9.0	15.0	0	5.0	2754	612	=
Kotlík	19 80-81	28.0	30.0	14.0	20.0	0	8.0	34 29	210	= :
Mountain Village	1980-81	31.0	48.0	16.0	3.0	•	2.0	4420	822	-
Quinhagok	19 83	44.0	21.0	12.0	17.0	0	7.0	3656	756	Volfe et al. 1984
Sheldon Pt.	19 80- 81	48.0	30.0	5.0	15.0	•	2.0	9784	1397	Wolfe 1981
Stebbina	19 80- 81	39.0	23.0	2.0	32.0	•	5.0	6375	1006	=
Arctic										
Kivaline	1982-83	0	26.0	18.0	56.0	0	0	n.a.	/ (01	Burch 1984
Kivalina	19 83-84	0	29.0	27.0	44.0	0	0	п.а.	1117	:
Southeast										
Haines	19 82-83	33.0	30.0	26.0	1.0	4.0	6.0	343	114	Wills et al. 1984
r i nkuan	1982-83	67.0	19.7	8.0	1.0	.	4.0	663	174	Mills et al. 1984

survival. In contrast, land mammals today may contribute a larger proportion of Tyonek's harvest than in the past when moose were less available. Correspondingly, marine mammals probably contributed less during the study period than 40-50 years ago.

HARVEST LEVELS

The mean household harvest for Tyonek households for the 12 month survey period was 964 pounds while, the per capita harvest was 272 pounds. These estimates are probably representative of harvest levels during the study period, but household harvests may have been lower in the late 1970s when subsistence king salmon fishing was closed by state regulations. These per capita harvests of fish and game were among the highest recorded in Southcentral Alaska during the study period. Only the dispersed community of Nabesna Road in the Copper River Basin reported a higher per capita harvest then Tyonek, 280 pounds. About half of the ten households along the Nabesna Road were engaged in big game guiding or operated air taxi services when the survey took place; these were factors which tended to increase household harvests in the Copper Basin (Stratton and Georgette 1984:156-157). Notably, there were no big game guides or air taxi operators living in Tyonek in 1983-1984 when these harvest data were collected.

Household harvest levels in Tyonek as reported during the survey period were lower than those reported for some communities in southwestern and western Alaska (Table 15). The difference between Tyonek and the Yukon Delta and Bristol Bay villages may not be as great as the figures suggest, however. The per capita figure for Tyonek is based on

a 100 percent sample of the community, about 20 percent of which harvested 250 pounds or less of wild foods. In contrast, interviewed households in the other communities were selected for their active participation in and knowledge of resource harvesting; thus there is some degree of a bias towards more productive households (Wolfe 1983:21-22; Behnke 1982:42-43). In addition, in Nondalton large quantities of sockeye salmon were put up for dog food, and were included in the reported harvest totals (Behnke, pers. com.). During the study period, snowmachines, ATVs, and pickup trucks had replaced dog teams in Tyonek.

Nevertheless, comparisons with the reported resource harvests of southwest Alaskan and Bristol Bay communities suggest that the volume of fish and game harvests in Tyonek has declined from that of the past. Several factors have probably led to this lowering of harvest quantities.

First, as noted above, cash has been more readily available in the village since the mid 1960s. Although food costs were high in the village, with Anchorage only 45 miles away it was economically feasible to stock up purchased food stuffs, especially vegetables and carbohydrates, through bulk purchases in town. As this report has shown, by no means have purchased foods replaced wild resources in the village. Most meat and fish were derived from local harvests during the study period. However, purchased food items have reduced the demand for calories from wild food products. Cash was available to most households. Wage employment, mostly through seasonal government programs, was engaged in by 74 percent of the households.

As noted in Chapter 5, household harvests exhibited a wide range in size during the study period. About 22 percent of the households harvested less than 250 pounds, while 45 percent harvested more than 1000 pounds. In understanding the overall level of resource harvest in Tyonek, it is instructive to examine the characteristics of productive households. First, the mean annual harvest of households with at least one member engaged part of the year in commercial fishing (n=28) was 1362 pounds, significantly higher than the 676 pound mean harvest of households without a commercial fisherman present (Fig. 48). Households with commercial fishermen also harvested more salmon for home use. These findings were not unexpected, in that on the average, households with commercial fishmen owned more equipment which supported harvesting activities, such as dories, motors, and pickup trucks, and facilities such as fishcamps and smokehouses. In addition, commercial fishermen had more control over their time than did the households engaged exclusively in wage employment, and therefore could direct more effort to resource harvesting. Finally, although commercial fishing income was not high, these household had supplies of cash that were invested in resource production for local use. About 32 percent of the commercial fishing households also had members at least seasonally involved in wage employment, which increased the households' money supplies. In short, the findings of the Tyonek study support the conclusion that simple commodity production activities such as commercial fishing are compatible with subsistence production (Wolfe et al. 1984:545-562).

Another factor found to be significantly related to harvest levels in Tyonek was age of the oldest household member. As Figure 49 illustrates, households headed by individuals aged 19-29 harvested a



Figure 48. Mean household harvests of wild resources in pounds edible weight, of commercial fishing households and non-commercial fishing households, Tyonek, February 1983-January 1984. 190



¹⁹⁸³⁻January 1984.

mean of 469 pounds of resources, while households with heads aged 60-69 averaged 1,549 pounds. In earlier chapters, the important role of older people in leading resource harvesting activities in Tyonek was discussed, especially in organizing salmon harvesting, the most productive activity in the village. Given Dena'ina traditions about leadership roles, it is not surprising that households with older members to stimulate and encourage fishing and hunting harvested the most wild foods. Also, as the next section discusses, households headed by older people tended to be linked through kinship ties with other households, which established an obligation to share resources, hence stimulating production.

Directly related to age of the oldest household member was the size of the household. Households with heads in their 50s and 60s tended to be larger, with several adult or subadult children. Household size was significantly related to harvest size; the larger the household, the more wild resources harvested overall (Fig. 50). Also, larger households harvested a greater diversity of resources. Figure 50 illustrates that one-person households harvested a mean of 436 pounds of resources, while households with five members harvested a mean of 964 pounds, and those with six members harvested 1632 pounds on average. Households with seven or more members had a mean harvest of 1999 pounds. Also, households with two or more moose hunters (usually sub-adult or adult men), had higher household harvests than those with one hunter or less (Fig. 51). The availability of labor to harvest and process wild foods accounts in part for these relationships, as does the relatively higher resource needs of larger households. Smaller households often assisted larger ones in salmon fishing, for example, in exchange for a



Figure 50. Mean household harvests of wild resources, in pounds edible weight, grouped by household size, Tyonek, February 1983-January 1984.



Figure 51. Mean household harvests of wild resources in pounds and edible weight, by number of moose hunters in the household, Tyonek, February 1983-January 1984.

portion of the catch, which was credited to the larger hosehold's harvest in some cases. Correspondingly, larger households headed by older people with offspring living in the residences could call upon these kinsmen for assistance. Again, this production was considered part of the senior household's harvest totals.

In summary, within Tyonek during the study period, household harvests contrasted based upon several characteristics, including involvement in commercial fishing, age of household head, and household size. Many households harvesting less than 250 pounds of wildfoods, about 22 percent of the village, were small, young, and either soley engaged in wage employment or unemployed. They lacked the time, labor, equipment, and knowledge, and sometimes the cash, required for resource harvesting as independent units. However, it would be incorrect to conclude that these households were "outside" the subsistence-based system in Tyonek (cf. Wolfe 1982:264-265). As discussed further in Chapter 6, small, unproductive households typically received foods from others in the village, and sometimes assisted with resource processing as well.

MODE OF PRODUCTION

In the 19th century, the primary production unit of the Upper Inlet Dena'ina was the multifamily household headed by a senior male kinsman called a <u>qeshqa</u>. The principles of matrilineal kinship and clan membership were replaced by bilateral kinship and nuclear family residence by the early 20th century (Fall 1981). Although its

principles of organization had changed, kinship continued to organize groups within which fishing and hunting occurred.

As discussed in Chapter 5 and 6, a "domestic mode of production" (Sahlins 1972; Wolfe 1982:257-259; Wolfe et al. 1984) for harvesting fish and game for subsistence prevailed within the community during the study period. As in other Alaska communities with a subsistence-based socioeconomic system, principles of extended kinship structured resource harvesting and processing. A common production unit was a group of related households which shared fishcamps, processing facilities, and hunting and fishing equipment. Within these units, harvesting and processing roles were assumed largely based on age, sex, and experience. The operation of these extended family units was most visible during subsistence salmon fishing. The size and composition of production units differed according to the type of harvesting activity. Many hunters often formed "partnerships" which crossed the kinship boundaries of the extended family groups; although members of these units commonly hunted together as well. Some activities, such as clamming, were organized by experienced leaders. Such harvesting groups were also organized according to kinship principles, but again were extended to include many households.

Within this domestic system of production, leadership was very important. Leaders were almost always older, experienced men or sometimes women. They were commonly commercial fishermen and "owners" of fish camps. In some cases, leaders themselves did not directly participate in the harvest of resources such as salmon or moose. Rather, they organized the activity, deciding when the harvest would take place and which roles each family member would perform. Leaders decided when

supplies of food were sufficient, and with whom to share resources. In organizing a group of kin, "owning" camps and facilities, and controlling the distribution of food products, leaders in Tyonek retained some of the characteristics of the traditional <u>geshqa</u>. Correspondingly, older people in the community who have been successful hunters and fishermen, who also exhibit skills in commercial enterprises such as commercial fishing, and who shared their "wealth" in the form of food products or, for example, contributions to the church were highly respected in the community and have occupied roles of political leadership in the village. Clearly, other skills are required for village leaders today, such as familiarity with government bureaucracies and education; nevertheless, demonstrable knowledge and skills in regard to hunting and fishing remained important to achieving respect and influence in the village.

Finally, the domestic mode continued to provide a context for the education of the young. Hunting and fishing skills and processing skills were learned while observing and accompanying family members to fishcamps, on moose hunting trips, and in clamming parties.

NETWORKS OF DISTRIBUTION AND EXCHANGE

In subsistence-based socioeconomic systems, wild resource harvests are distributed throughout the community along non-commercial networks of exchange (Wolfe 1982:264; Wolfe et al. 1984). As documented in this report, the sharing of fish and game harvests in Tyonek was extremely common and extensive during the study period. As in the past, distribution and exchange were organized according to kinship and

seniority, and provided another means by which social relationships in the community were expressed and by which community cohesiveness and integration were maintained.

The extent of sharing resources that occurred varied according to the resource. Salmon harvests were used mostly by the household or, more commonly, the extended family group that processed the fish. A noteworthy exception was that village elders sometimes received smoked products, as well as most other types of subsistence foods. Most extended family units harvested their own salmon either by using their own equipment or borrowing from others. Resources that were harvested in large quantities by fewer households or extended family units, such as clams and marine mammals, were shared widely throughout the community. Harvesting these resources required special knowledge and the ownership of expensive equipment that was possessed by only a few people in the community. It is likely that in return for the distribution, the harvesters received the respect of the village and thus enhanced their overall standing in the community.

Moose were generally shared within more limited networks of households which regularly exchanged their successful harvests. Village elders were usually included in these networks, although they themselves did no harvesting. Moose sharing networks expanded when harvests of this resource were low. Resources harvested in small amounts such as small game, waterfowl, or freshwater fish were not shared extensively.

The distribution of resource in Tyonek was largely governed by the principle of generalized reciprocity (Sahlins 1972), whereby the successful harvesters shared their catch with no expectations of an immediate return. There was little or no "bartering," "swapping," or

direct exchange ("balanced reciprocity"). With moose hunting (and possibly also bear) households with active hunters were included in the exchange networks of a successful hunter. This created an obligation of return in the future when the recipients themselves took a moose.

CONCLUSIONS

Research conducted by the Division of Subsistence in Tyonek in 1980-84 demonstrated the continued economic, social, and cultural significance of fishing, hunting, and gathering wild renewable resources to the contemporary way of life of the community. Resource harvesting was nutrionally important, in providing most households with a large portion of their yearly food supplies. Fishing, hunting, and gathering were socially significant in forming contexts during which the enculturation of the young occurred and socially prescribed roles were performed by members of extended families. The sharing of resources with relatives, friends, and elders was a major factor in maintaining community cohesion. Also, wild resource use was culturally important as a focus of community identity and in reinforcing the traditional values of diligent resource production, careful planning, and generous sharing.

As in many other rural communities in Alaska resource harvesting in Tyonek in the late 1970s and early 1980s took place within a mixed economy, in which the use of cash and seasonal monetary employment had become integrated. Changes in the regional and state economies and the development of new social and political institutions have had major consequences on hunting, fishing, and gathering activities in Tyonek. Nevertheless the village has maintained a viable, kinship-based system

of wild resource harvest production, and exchange. Per capita harvests of fish and game products were among the highest in southcentral Alaska during the study period. Almost half of the village households harvested over 1,000 pounds of wild foods in 1983-84. Extensive sharing networks brought these resources to almost every village household.

Considering Tyonek's history and current pattern of resource use, several conditions can be hypothesized as critical to the continued survival of subsistence hunting and fishing in the village (cf. Wolfe et al. 1984:555-560). First, it is clear that habitat protection and prudent resource management must be maintained. In the past, depletion of salmon by commercial fisheries and of game resources have created periods of social disruption in Tyonek. A second condition is continued access to fish and game resources through a sensible regulatory structure that permits traditional uses while protecting the resources from the harvest pressure of rapidly growing urban Alaska. The elimination of the king salmon subsistence fishery through re-allocation of the resource to other user groups, for example, would be particularly detrimental to the village's economy and way of life. Third, the community must be involved in all decisions regarding resource development in its vicinity. The successful integration of such activities within Tyonek's subsistence economy will be accomplished only through insightful planning and examining the records of past developments in the area.

Finally, and perhaps, most important, Tyonek will be able to protect its way of life by fostering a strong, community organization and effective leadership. The history of the village includes many examples of the Tyonek people banding together in the face of challenges. Examples include expelling exploitive Russian traders in

the 1790s; acquiring a reserve from the federal government in 1915; re-establishing the village and incorporating the Susitna and Kustatan people after the 1918 influenza epidemic and the flooding of the village in the late 1920s; organizing to win the right to lease village lands for oil and gas exploration in the 1960s; and regaining subsistence fishing opportunities in the 1980s. Considering the possibilities for resource development in the Tyonek area in the near future, including Beluga Coal and the Chakachatna hydroelectric project, it is likely that the village will continue to face new challenges to maintain its distinctive way of life within one of the state's most dynamic regions.

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APPENDIX A

TYONEK MARINE MAMMAL USE SURVEY

1.	Have you ever hunted marine mammals? Yes No
2.	Who did you learn how to harvest marine mammals from?
	Relationship?
3.	How old were you when you first hunted marine mammals?
	How old are you now?
4.	What types of marine mammals have you hunted?
5.	Did you participate in the Federal bounty program on marine mammals in
	Cook Inlet? Yes No
	When?
	Where?
	Were the harvested animals used other than for collection of bounty navment?
	How much was payments per animal? Species Payment
6.	Could you estimate the number of belukha you have harvested in the past 5
	years? In your lifetime?
	What year did you harvest your first belukha?
	When was the last time(year) you harvested a belukha?
7.	Could you estimate the number of seals you have harvested in the past 5
	years? In your lifetime?
	What year did you harvest your first seal?
	When was the last time(year) you harvested a seal?
8.	Other marine mammals? Species Number
9.	What method(s) of harvest do you use?(equipment)

Do the past?	e above Yes	method(s) differ Ho	from how y w?	vou harvest	ed marine	mammals	tn
How	is the	animal us	ed after	harvestedi	?	· · · · · · · · · · · · · · · · · · ·		
What	method	s of pres	ervation	do you use	e for beluk	:ha?		
For	seals?			· · · · · · · · · · · · · · · · · · ·				· · · · · · · · · · · · · · · · · · ·
Have Yes	your m	ethods of No	preserva How	tion chang	ged over ti	me for ma	rine mam	mal
Does Yes	distri	bution of No	the harv How	ested anim is distrit	mal occur w Dution of c	vithin the ertain po	village rtions of	? f tł

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When?
Has your use (hunting) of marine mammals increased or decreased since you first started hunting? Why?
How many times a year do you hunt marine mammals?
What other activities do you engage in while hunting marine mammals? (e.g. clamming, transit to and from moose hunting, between commercia and subsistence open fishing period)
Did you receive belukha from someone in the past year?
Did you receive belukha from someone in the past 5 years?
Did you receive seal from someone in the past year?
Who? Did you receive seal from someone in the past 5 years?

HOUSEHOLD	
ID/PERMIT	#

Date	
	-

Interview By_____

 Did anyone in your household hunt moose in September 1983/ November 1983/January 1984/Did not hunt?

(Circle one or any combination. If no one hunted go to #11.)

- 2. How many people in your household hunted moose during September, November, and January?
- 3. What kinds of equipment and methods did you use for hunting moose in November (Hunted from a camp or from home, with a boat, truck, ATV, etc)? Please explain._____

During January?_____

- 4. If your household killed one or more moose, when? September/November/January How many? / /
- 5. What sex moose did your household harvest? Male Female Sept. Nov. Jan.

6. When you or the other person(s) in your household got the moose did you/they hunt with any partners? How many partners _________
Please explain ______

- 7. When did you first learn about the November moose hunt?_
- 8. How did your knowledge of the November season affect your September
 hunting?______
- 9. How did you preserve your moose meat this year? (Please estimate the percentage by each method)

	Sept. Nov	. Jan	•
Frozen (freezer)	- %	%	%
Frozen (outdoors)_	%%	%%	%
Smoke/Dry	%	%	%
Can/Jar	%	%	%
Corn/Pickle	%	<u>%</u>	%
Salt	% %	%	%
Fresh	%%	%	%
Other	%	%	%

- 10. Where (map location) did you or other household members (hunt)(kill) moose: in September (+) and in November(*) and in January (#). Did you/they hunt along the route to your/their main hunting area? Yes / No
- 11. What dates would best provide you the opportunity to harvest moose?

Why?

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12. How many people live in this household?

	ages			
males		 ···	 	
females		 	 	
total				

- 13. Please estimate what percent of your household meat, fish, and fowl in the past year has been from wild resources. _____%
- 14. Which of the following are sources of income for your household?

	Months/Year
Commercial Fishing	·
Village Administration	
School	
Store	
Timber Camp	
Trapping	
Mining	
Construction	
Other	
Other	

15. Other Resources (Matrix)

16. What other ideas or concerns do you have about moose or other fish and game seasons, etc?_____

RESOURCES USED FOR HOME CONSUMPTION DURING 1983

- --

RESOURCE	ATTEMPTED HARVEST IN 1983?	QUANTITY HARVESTED IN 1983	HOW MANY HH DID YOU RECEIVE FROM?	HOW MANY HH DID YOU GIVE TO?
KING SALMON**	HL/COMM/SUB			
RED SALMON**	HL/COMM/SUB			
SILVER SALMON**	HL/COMM/SUB			
PINK SALMON**	HL/COMM/SUB			
CHUM SALMON**	HL/COMM/SUB			
RAINBOW TROUT				
DOLLY VARDEN				
GRAYLING				
LAKE TROUT				
BURBOT				
PIKE	-			
TOM COD				
WHITEFISH 5 mml				
HOOLIGAN (BKTS)				
OTHER FISH				
RAZOR CLAMS (BKTS)				
BUTTER CLAMS (BKTS)		 		
COCKLE (BKTS)				
OTHER SHELLFISH (QTY	<u>)</u>			
SEAL		<u> </u>		<u>↓</u>
BELUKHA				
MOOSE				
CARIBOU				
SHEEP				i i

* Determine how used.

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** Estimate quantities by each method of harvest.

RESOURCE	ATTEMPTED HARVEST IN 19832	QUANTITY HARVESTED IN 1983	HOW MANY HH DID YOU RECEIVE FROM?	HOW MANY HH DID YOU GIVE TO?	
BLACK BEAR*					Ţ
BROWN BEAR*					t
OTHER					t
SPRUCE GROUSE					t
PTARMIGAN					Ť
DUCK					Ť
GEESE					T
SNOWSHOE HARE	TRAP/SHOT				T
PORCUPINE*	TRAP/SHOT				T
RED SQUIRREL*	TRAP/SHOT				T
GROUND SQUIRREL					Ι
FLYING SQUIRREL					
MARTEN					
RED FOX	TRAP/SHOT				I
COYOTE	TRAP/SHOT				
WOLF	TRAP/SHOT				
MINK					
WEASEL					
BEAVER*					╞
LYNX*	TRAP/SHOT	+			╞
LAND OTTER					\downarrow
MUSKRAT*					╡
WOLVERINE	TRAP/SHOT				

*Determine how used.

RESOURCE	ATTEMPTED HARVEST IN 1983?	QUANTITY HARVESTED IN 1983	HOW MANY HH DID YOU RECEIVE FROM?	HOW MANY HH DID YOU GIVE TO?	
BERRIES (QTS)					_
EDIBLE PLANTS					_
MEDICINAL PLANTS					
WOOD (FIRE)					-
WOOD (LOGS)					
COAL (QTY)					ſ
OTHER					

APPENDIX C

FISH, WILDLIFE AND PLANT SPECIES USED HISTORICALLY AND CURRENTLY BY TYONEK RESIDENTS.

Common American Name	Dena'ina Name	Scientific Name
Moose	dnigi	Alces acles
largest bull	k'eyits'a taya	
COW	devuyi	
calf	k'dechiga	
bull in rutting season	k'talnigi	
Black bear	ghedisla	Ursus americanus
Brown-grizzly bear	ggagga	Ursus horribilis
Large grizzly bear	k'ehdil'ani	
Sheep	nuji	Ovis dalli
Porcupine	ganchi	Erethizon dorsatum
Red squirrel	deldida	Tamiasciurus hudsonicus
Parka squirrel	gunsha	Citellus parryi
Flying squirrel	ts'elga	Gluacomys sabrinus
Hare, snowshoe	ggeh	Lepus americanus
Marmot	shq'ula	Marmota caligata
Seal, harbor	qutsaghi l 'iy	Phoca vitulina
Belukha	quyushi	Delphinapterus leucas
Beaver	k'enuy'a	Castor canadensis
Muskrat	taltsuda	Ondatra zibethicus
Mink	tach'ich'a	Mustela vison
Otter, land	taht'in	Lutra canadensis
Marten, pine	skintehi	Martes americana
Large, male marten	betl'ak'ghinigi	
Weasel, short-tailed	kaghelna	Mustela erminea
Weasel, least	kina	Mustela rixosa
Fox, red	ninyagga	Vulpes fulva
cross	tsubudusga	
black	k't'esha	
silver	betuk'ituni	
yellow-checked	bentl'u qeltseghi	
Coyote		Canis latrans
Wolf	tiqundi	Canis lupus
Wolverine	nelchish	Gulo gulo
Lynx	nidyi	Lynx canadensis
Waterfowl	da l ishla	
Loon, common	dujeni	Gavia immer
Swan, whistling	quggesh	Olor columbianus
Goose, canada	nut'aq'i	Branta canadensis
Goose, white-fronted	ndalbay	Anser Albifrons
Goose, snow	Ts'iluna, ts'enluyna	Chen hyperborea
Mallard	qadeltsigi	Anas platyrhynchos
Pintail	kadi nasa	Anas acuta
Teal, green-winged	qutnelyesa	Anas carolinensis
Golden eye, common	bentl'u qelts'eli	Bucephala clangula
Wigeon, american	ben da l isla	Anas americana
Shoveler, northern	duyestala	Anas clypeata
Buttlehead	bantl'u qelch'eli	bucephala albeola
Scoter, Black	quk'eIdeIi	<u>Malanitta nigra</u>

Greater scaup Merganzer, common Harlequin duck Grouse, spruce Ptarmigan, rock willow white-tailed Crane, sandhill Gull, (any) large Clam, razor Cockle Salmon, king pink red chum silver fingerling spawning dead Trout, rainbow steelhead Dolly Varden Grayling Eulachon, smelt Burbot Tomcod, pacific Sucker Fish roe Whitefish Rosehip Lowbush blueberry Highbush blueberry Raspberry Lowbush cranberry Highbush cranberry Currant Red Crowberry Alder, mountain Birch, paper Fungi (growing on trees) Spruce Cottonwood Willow Wild Rhubarb Wild Celery Indian Potato

jija vek'ilggeyi cheghesh qeshqa betsa'a elvuni q'ats'ema delggema dzel yitseghi ndal nulbay tl'iq'a bedza qiy.'in esdghuga lig'aka'a quqhuna q'uya seyi nudlegha **Į**iq'agga tuydlaghi tiĮtani telaghi usdlaghi dhelay tsebaya ts'dat'ana dilhi ts'anya hey tsagela duch'ehdi q'in lih nkish gegashla gantsa ts'en[t'ida hey gega tsunItsa nunayk'et'i gegayna geng'eya q'ey elch'ish ts'bala t'ghes q'eylu kashi qqis k'tl'ila

Dena'ina Name'

Scientific Name

Aythya marila Mergus merganzer Histrionicus histrionicus Canachites canadensis Logopus mutus Lagopus logopus Lagopus leucurus Grus canadensis Larus sp. Siliqua patula Clinocardium ssp. Oncorhynchus tschawytscha 0. gorbuscha 0. nerka 0. keta 0. kisutch Salmo gairdneri Salmo gairdneri Salvelinus malma Thymallus arcticus Hypomesus pretiosus Lota lota Microgadus proximus Catostomos cataostromus Coregonus clupeaformis Rosa acicularis Vaccinium uliginosum L. Vaccinium ovalifolium Sm. Rubus idaeus Vaccinium vitis-idaea Virurnum edule Ribes triste Empetrum nigrum L. Alnus crispa Betula papyrifera Ganoderma applanatum Picea spp. Populus spp. Salix spp. Rumex arcticus Heracleum lanatum Hedysarum alpinum

Source: Kari: 1977; written in upper inlet dialect

APPENDIX D CONVERSION TABLE

Species	Edible Weight	Source
King Salmon	18.0	Commercial Fisheries
Red Salmon	4.0	Commercial Fisheries
Silver Salmon	6.0	Commercial Fisheries
Pink Salmon	2.0	Commercial Fisheries
Chum Salmon	6.0	Commercial Fisheries
Dolly Varden	1.0	Researchers Estimate
Rainbow Trout	1.5	Researchers Estimate
Hooligan	.25	Researchers Estimate
Whitefish	1.0	Researchers Estimate
Grayling	.8	Researchers Estimate
Clams: Surf	.13	Researchers Estimate
Razor	.25	Researchers Estimate
Belukha Whale	700.0	Researchers Estimate
Moose	500.0	Taylor 1982
Black Bear	58.0	Miller 1983
Porcupine	4.5	Whitman 1983
Snowshoe Hare	1.5	Researchers Estimate
Beaver	8.75	Whitman 1983
Ptarmigan	.5	Researchers Estimate
Spruce Grouse	.5	Researchers Estimate
Ducks	1.5	Researchers Estimate
Geese	3.0	Researchers Estimate
Berries	1.0	Researchers Estimate
Mushrooms	.6	Researchers Estimate