

**SUBSISTENCE USE OF FISH AND WILDLIFE
IN KOTZEBUE,
A NORTHWEST ALASKA REGIONAL CENTER**

by
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ABSTRACT

This study describes the subsistence uses of fish and wildlife in 1986 by residents of the regional center of Kotzebue in northwest Alaska. Included in this report are estimated harvest levels, seasonality of harvest, methods and means of harvest, processing and preservation methods, distribution, wild resource trade and barter, and use of camps in harvest activities. Data on demographics, employment, and income are also presented.

Kotzebue is located 26 miles north of the Arctic Circle along the coast of Kotzebue Sound near the mouths of three major river systems -- the Noatak, Kobuk, and Selawik. Archeological findings indicate that people have continuously occupied the Kotzebue Sound area for the past 4,000 years and the present-day Kotzebue area for the past 600 years. In 1986, Kotzebue had an estimated 765 households and a population of 2,681, about three-quarters of whom were Alaska Native, primarily Iñupiaq Eskimo. The largest community in the region, Kotzebue serves as a regional service and distribution center for the Northwest Arctic Borough, an area of 43,298 square miles encompassing 11 Iñupiaq communities. Study findings showed that Kotzebue residents originated from a diversity of places: about one-quarter of household heads and spouses were born in Kotzebue, about one-quarter were born in other communities in the region, and about 40 percent were born outside Alaska. Kotzebue residents also varied widely in the length of time they had lived in Kotzebue.

During the study period, government dominated Kotzebue's economy and employment opportunities. An estimated 69.4 percent of Kotzebue households had at least one person employed directly by local, state, or federal governments. Other significant employment sectors included services, trade, and commercial fishing. Nearly all Kotzebue households (96.6 percent) had at least some employment in 1986 and more than 70 percent had the equivalent of 52 weeks or more of employment per year. The estimated mean income for Kotzebue households in 1986 was \$40,431 of which an estimated 95.6 percent was earned income.

As a regional center, Kotzebue had a more diverse population and greater employment opportunities than the smaller, surrounding communities. Nevertheless, Kotzebue residents continued to participate widely in subsistence activities. In 1986, an estimated 78.4 percent of Kotzebue households harvested and an estimated 100 percent used wild food. Greatest harvest participation occurred with berries, salmon, caribou, and sheefish. Other prominent resources in terms of harvest included moose, bearded and ringed seal, waterfowl, ptarmigan, Dolly Varden, whitefish, saffron cod, northern pike, arctic grayling, burbot, and Pacific herring.

Kotzebue households harvested an estimated total of 1,067,278 pounds of edible wild resources in 1986. This was the equivalent of an average household harvest 1,395.2 pounds and an average per capita harvest of 398.1 pounds. Four species accounted for 74.0 percent of Kotzebue's wild food harvest by weight: caribou (24.4 percent), bearded seal (19.0 percent), salmon (18.4 percent), and sheefish (12.2 percent). Other resources each contributed less than 3.5 percent to Kotzebue's total harvest. In nearly all resources, Native households substantially surpassed non-Native households in both harvest participation and harvest quantities.

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CHAPTER I

INTRODUCTION

This report describes the use of fish and wildlife by residents of Kotzebue, a regional center in northwest Alaska (Fig. 1). Kotzebue serves as a regional service and distribution center for the Northwest Arctic Borough, an area of 43,298 square miles with a total population of about 6,000, predominantly Iñupiaq Eskimo. The smaller outlying communities served by Kotzebue include Ambler, Buckland, Deering, Kiana, Kivalina, Kobuk, Noatak, Noorvik, Point Hope, Selawik, and Shungnak.

In response to proposed land use designations and natural resource developments, numerous studies have been conducted since the early 1950s on contemporary subsistence activities and the rural economy of northwest Alaska. These include Anderson, Bane, Nelson, Anderson, and Sheldon (1975) on the Kobuk Eskimo; Uhl and Uhl (1977, 1979) on the Cape Krusenstern area and the Noatak River valley; Burch (1985) on Kivalina; Patterson (1974) on community subsistence harvests; and Schroeder, Andersen, and Hildreth (1987) on subsistence use areas for ten communities in the region. Other reports include Alaska Consultants (1984) on Eskimo whaling; Cultural Dynamics (1983) on the Kotzebue Sound region for the Outer Continental Shelf Management Plan; Braund and Burnham (1983) on Kivalina and Noatak; Giddings (1952, 1961) on the Kobuk River; Foote (1966) on the upper Kobuk River; Foote (1959, 1961) and Foote and Williamson (1966) on Point Hope and Noatak; Saario and Kessel (1966) on Kivalina; and Woolford (1954) on arctic Alaska communities. Together these reports document harvests of fish and game, land use patterns, seasonal rounds, and subsistence-based mixed economies for the region.

Less information is available on contemporary resource use in the regional center of Kotzebue. By all visible indications, subsistence production and use continue to contribute significantly to Kotzebue's economy and culture. A regionwide 1972 survey conducted by the

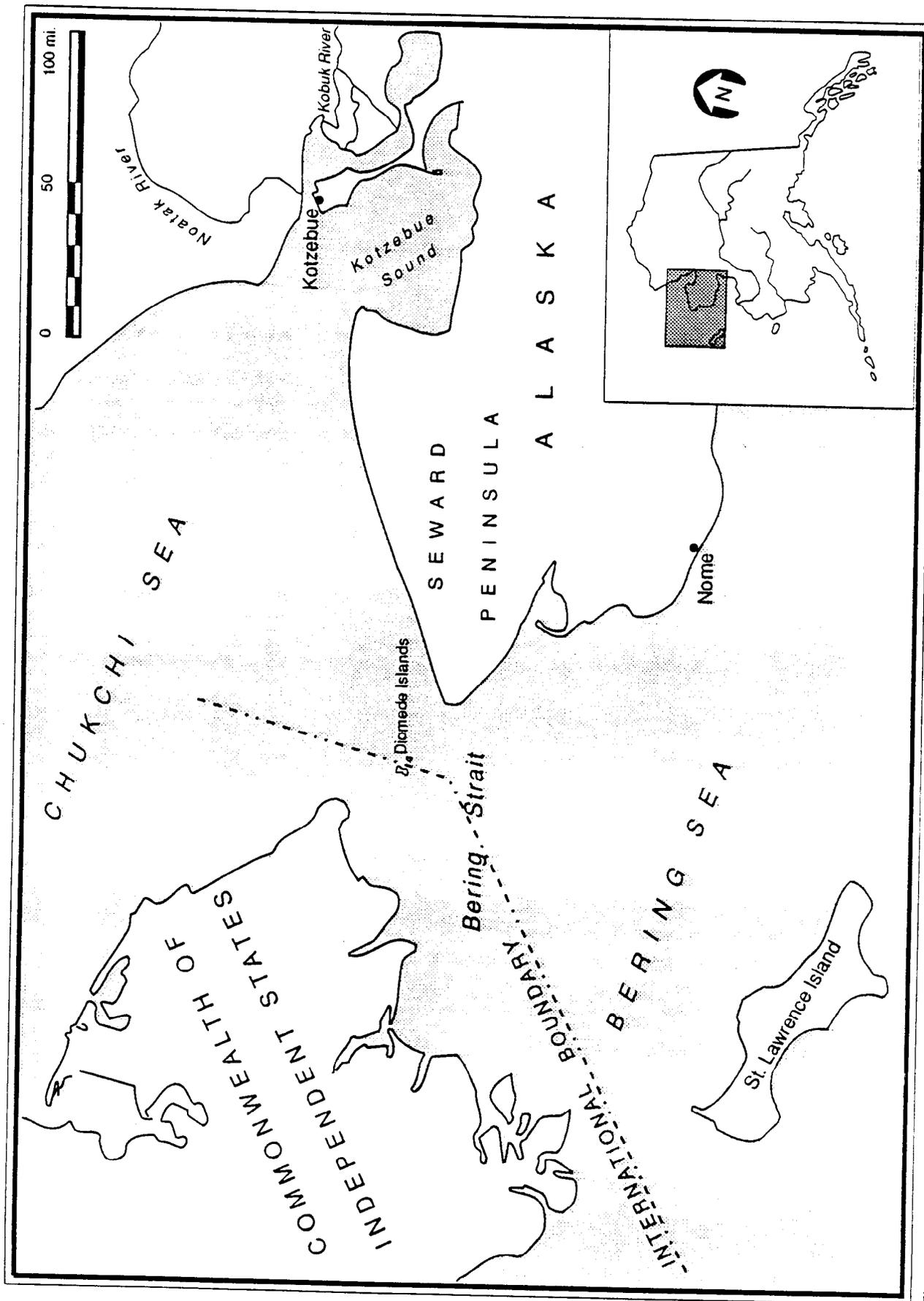


Fig. 1. Location of northwest Alaska in relationship to Asia.

local Native regional corporation estimated that 1,081,973 pounds of subsistence foods were annually harvested by Kotzebue residents, or 638 pounds per person (Patterson 1974). The same study found that the per capita harvests in the other communities in the region ranged from 450 to 2,700 pounds with all but two communities in the 1,100 to 1,900 pound range.

As a regional center, Kotzebue is different from other communities in the region in several important respects. Most evident is population size. In 1985, the average community population in the borough, excluding Kotzebue, was 307 people (Alaska Department of Labor 1987:58). Kotzebue, with a 1985 population of 2,633, was thus more than eight times larger than the average community in the region and more than four times larger than the second largest community in the region, Selawik, with a 1985 population of 589. In 1985, 45.5 percent of the borough's population resided in Kotzebue.

Communities of this size did not exist until recently. Historically, the Iñupiat of northwest Alaska lived widely scattered across the land in small family clusters of usually 30 to 60 people (Burch 1980:265). The largest settlements had a couple hundred people and were situated at a few productive localities along the coast where sea mammal migration routes were easily intercepted. During the 20th century, most northwest Alaska Iñupiat became centralized in permanent winter villages with populations that rarely exceeded 500, with the exception of Kotzebue.

Other differences exist between regional centers and villages besides population size. Typically regional centers have more jobs available in nearly all segments of the economy than the smaller, more remote communities. Additionally, regional centers typically comprise a population of more diverse origin, both in terms of the proportion of Natives to non-Natives and in terms of the variety of natal communities.

The ways in which these factors might shape Kotzebue's use of fish and wildlife have not been documented. Recently it has been suggested that the socioeconomic systems of Alaska's regional centers are a special type (Wolfe 1983:268-271). Unlike that of urban communities, hunting and fishing are integrated with wage employment for a substantial portion of the

population. In contrast to rural villages, regional center populations are heterogeneous in terms of culture, birthplace, education, employment, and length of residency.

Kotzebue's role as a regional center is not a new one. With its location on the coast near the mouth of several major interior river systems, the original village of *Qikiqtaġruk* was a crossroads in an extensive trading pattern linking Siberian Eskimos across the arctic to the MacKenzie Eskimos and northern Athabaskan Indians in Canada. Burch (1980) describes annual trade fairs held at three locations in northwest Alaska in the early 19th century, the largest of which was held at Sheshalik Spit (*Sisualik*), ten miles northwest of Kotzebue. This fair drew 2,000 or more people, some from as far away as the Point Hope, Shishmaref, and Wales areas, the Bering Strait islands, and occasionally the Asiatic mainland. The gathering was the largest regular concentration of people in the entire Eskimo world (Burch 1984:305). Between 1881 and 1884, Kotzebue replaced *Sisualik* as the trading center, most likely because of its proximity to the ship anchorage off Cape Blossom (Anderson *et al.* 1975:41).

In the past decade, much of the research by the Division of Subsistence has focused on the role of fish and wildlife in the economies of small, predominantly Native communities. Research on subsistence uses in the state's regional centers has been less thorough. Some studies have been conducted in Nome (Ellanna 1983; Magdanz and Olanna 1984) and another in Dillingham (Fall, Schichnes, Chythlook, and Walker 1986). Information on regional centers is particularly critical since these communities, with relatively large and diverse populations, often present more complex management decisions than the smaller, outlying villages. Subsistence use information for Kotzebue should be useful to the Boards of Fisheries and Game as they evaluate new regulatory proposals; the Northwest Arctic Borough and City of Kotzebue in their land planning processes; the National Park Service, U.S. Fish and Wildlife Service, and Bureau of Land Management in their management plans; local Native organizations in their efforts to protect subsistence activities; and various other organizations and agencies involved in setting the regions's future course.

PURPOSE OF STUDY

This study had the following purposes:

- (1) to gather information on the contemporary harvest and use of fish and wildlife by Kotzebue residents;
- (2) to describe the distribution and exchange of fish and wildlife between Kotzebue and other communities in the region;
- (3) to examine the relationship of harvest activities to demography, employment, and equipment availability; and
- (4) to contribute to an understanding of regional centers' use of fish and wildlife in contemporary Alaska.

METHODOLOGY

Community approval for this project was obtained through individual consultations in October 1986 with staff of various local organizations and agencies, including the Northwest Arctic Borough, City of Kotzebue, Maniilaq Association, NANA Regional Corporation, Kotzebue Fish and Game Advisory Committee, Kotzebue IRA Council, National Park Service, U.S. Fish and Wildlife Service, and Bureau of Land Management. These organizations as well as other individuals reviewed the project's research design.

During development of the project design, researchers conducted interviews with key respondents in Kotzebue to obtain an overview of the species harvested, areas used for hunting and fishing, and regulatory and land use issues of concern to local residents. Four men and one woman were interviewed for these purposes in September 1986. Using an interview guide, researchers asked key respondents about the resources they harvested, harvest seasons, and changes in their hunting and fishing patterns over their lives. Key respondents were also asked to map the areas they have used for hunting and fishing activities over their lifetimes. This information aided in the preparation of a survey instrument and contributed descriptive material of Kotzebue's hunting and fishing practices.

Information for this study was also gathered using other standard anthropological research techniques including a household survey and participant observation. The survey collected quantitative information on resources harvested and used, patterns of resource exchange, use of camps, and economy and demography (Appendix 1). A total of 90 households were interviewed, 30 randomly selected from each of three stratified samples. Surveys were administered in person by Division of Subsistence staff, usually in the respondent's home. Surveying started at the end of January 1987. Most surveys were completed in February and March with a few done in April and May. Survey questions pertained to calendar year 1986.

Because both project researchers resided in Kotzebue, participation in and observation of subsistence activities were regular and on-going efforts. Researchers kept notes on these activities as well as on supplemental information offered by respondents during household surveys. These notes were keyworded and entered into a computerized database. A few hundred pages of notes were collected.

Data gathered from the survey instrument were coded, entered on a computer file, and analyzed with the Statistical Package for the Social Sciences (SPSS) program. Edible weights were obtained by applying a conversion factor to estimated live weights (Appendix 2).

Samples

According to the city planning department, Kotzebue had an estimated 930 housing units in 1986, most of them occupied. With constraints on time, budget, and personnel, it was not possible to interview each of these households with a lengthy survey. Instead Kotzebue households were stratified into three harvest categories, then households from each category were randomly selected to be interviewed. Households were stratified in order to obtain harvest estimates with a higher level of precision than would have been possible by simply interviewing the same number of randomly selected households. Interviewing proportionally more

"high-harvest" households, described below, allowed greater representation of the active hunters whose activities accounted for most of the community's harvest.

Stratification was based on a household's total harvest of subsistence foods during the previous year. Households were grouped into one of three categories: "high harvesters," "medium harvesters," and "low harvesters." High harvesters included households that took either ten or more caribou, ten or more seals, or more than 1,000 pounds of fish the previous year. Low harvesters were households that took less than 500 pounds of subsistence foods. Medium harvesters were households that fell between the low and high harvesters. The criteria for each of these harvest groups were determined with the advice of several key respondents.

To determine each household's harvest group, researchers conducted a house-to-house canvass in Kotzebue during six weeks in November and December 1986. Six local residents were temporarily hired to help with the canvass. Researchers visited each household, briefly described the project to an adult in each household, and asked them their name, household size, and one or two short questions about their household's harvest of subsistence foods during the previous year (Appendix 3). A City of Kotzebue blue-line property map was used to locate residences and keep track of households that had been canvassed. The house number, name of occupant, household size, and harvest group of each household were entered into a computerized spreadsheet.

Researchers were successful in directly contacting 88 percent of Kotzebue households during the canvass. The remaining 12 percent were out-of-town or unavailable for other reasons, so researchers resorted to their own judgment as to which harvest group these households belonged. In some cases, researchers were able to obtain information from friends or neighbors about a household's hunting and fishing activities. In the absence of evidence to the contrary, most households not contacted were placed in the low-harvest category. Many of these were single-person apartment dwellers who were often short-term residents owning little harvest equipment.

During the canvass, researchers counted a total of 885 housing units in Kotzebue, excluding institutional group housing (*e.g.*, the jail, prematernal home, senior center, and women's shelter) and seasonal dwellings in the "tent cities" north and south of town. Of the 885 housing units, 765 were occupied and 120 were unoccupied at the time of the canvass. Unoccupied units consisted of houses damaged by fire; old houses converted to storage areas or seasonal dwellings; houses owned and used occasionally by residents of other communities; houses temporarily vacant; and houses used as offices or businesses. For the purposes of this study, housing for temporary workers (*e.g.*, out-of-town construction workers) was considered unoccupied because these people were not permanent residents of the community.

Based on households' responses to the canvass, 516 of the 765 households were placed in the low-harvest category, 157 in the medium-harvest category, and 92 in the high-harvest category. Sampling 30 households in each category resulted in a weighting factor of 17.2 for the low-harvest group (one of every 17.2 households interviewed), 5.2 for the medium-harvest group (one of every 5.2 households interviewed), and 3.1 for the high-harvest group (one of every 3.1 households interviewed). Unless otherwise specified, data presented in this study have been expanded to the community as a whole using these sampling weights.

Limitations

Because a door-to-door canvass was used to identify and stratify households, it is possible that a small number of households were missed, particularly because some Kotzebue residents occupy non-standard housing not readily distinguishable as separate housing units. Therefore, the total number of housing units identified during the canvass was considered a minimum count.

Based on their response during the canvass, some households were placed in a harvest group that later proved to be inappropriate. This usually occurred for one of two reasons: 1) the adult interviewed during the canvass was unaware of harvests of other members of the household; or 2) the adult interviewed during the canvass misunderstood the researcher's question. As an

example, two households selected from the high-harvest group were later found when interviewed with the survey instrument to have harvested less than 500 pounds of wild foods, and should have been included in the low-harvest group. On the other hand, two households selected from the low-harvest group were later found when interviewed with the survey instrument to have harvested 4,500 pounds or more of wild foods, and should have been in the high-harvest group. In one case, one of the two sampled households taking beluga was in the low-harvest group which, when expanded by the low-harvest group weighting factor, led to a community harvest estimate for beluga that was in all probability too high for that year. This was also the case for polar bear harvest estimates.

Because the survey relied on respondents' recall, the data are ultimately only as good as respondents' memories. In general, most respondents seemed conscientious in their efforts to recall their harvests, although offering a harvest number for some resources caught in quantity, such as saffron cod or whitefish, often proved a challenge. Because completing all the surveys took longer than expected, the households interviewed in April and May 1987 might have had a more difficult time recalling their 1986 harvests than those interviewed in February and March 1987.

Finally, this study represents a very limited time depth. Harvest quantities for individuals and communities can vary widely over time as a result of changes in species abundance and distribution; weather and environmental conditions; socioeconomic factors, such as employment opportunities and cash availability; and other personal circumstances of individual harvesters. With only one year of harvest data, it is thus difficult to determine what the "average" range of subsistence production might be for Kotzebue or the extent to which this study's harvest estimates fall within such an "average" range.

CHAPTER 2

OVERVIEW OF ENVIRONMENT AND HISTORY

LOCATION AND ENVIRONMENT

Kotzebue is located in northwest Alaska about 26 miles north of the Arctic Circle (Fig. 2). It is situated at the northern end of a long peninsula separating Hotham Inlet, locally known as "Kobuk Lake," from Kotzebue Sound. This peninsula, officially called Baldwin Peninsula, is primarily rolling tundra-covered hills interspersed with lakes and low-lying marshy areas. Three major river systems -- the Noatak, Kobuk, and Selawik -- empty into the coastal waters near Kotzebue, depositing sediments that create a complex system of channels and sandbars. Two hundred miles west of Kotzebue is the eastern tip of Asia.

Due to the three major rivers terminating nearby, the coastal waters near Kotzebue are brackish and estuarine rather than marine saltwater. With favorable tides, winds, and currents, the water in the channel in front of Kotzebue is fresh enough to drink. This channel, influenced largely by the river systems, freezes up and breaks up significantly earlier than the marine waters at Cape Krusenstern. Thus the coastal resources available near Kotzebue differ from those available in a true marine environment.

Kotzebue's climate is a mix of maritime and continental influences. When the water surrounding Kotzebue is ice-free, usually from late May until October, a maritime type of climate prevails. During this period, cloudy skies are common, fog occurs, and westerly winds predominate. Summers are short and cool with temperatures usually between 40 and 60 degrees Fahrenheit. Many days, however, are pleasant enough for local children to swim outdoors and for families to picnic along the beach. Kotzebue's record high is 85 degrees (U.S. Department of Commerce 1983).

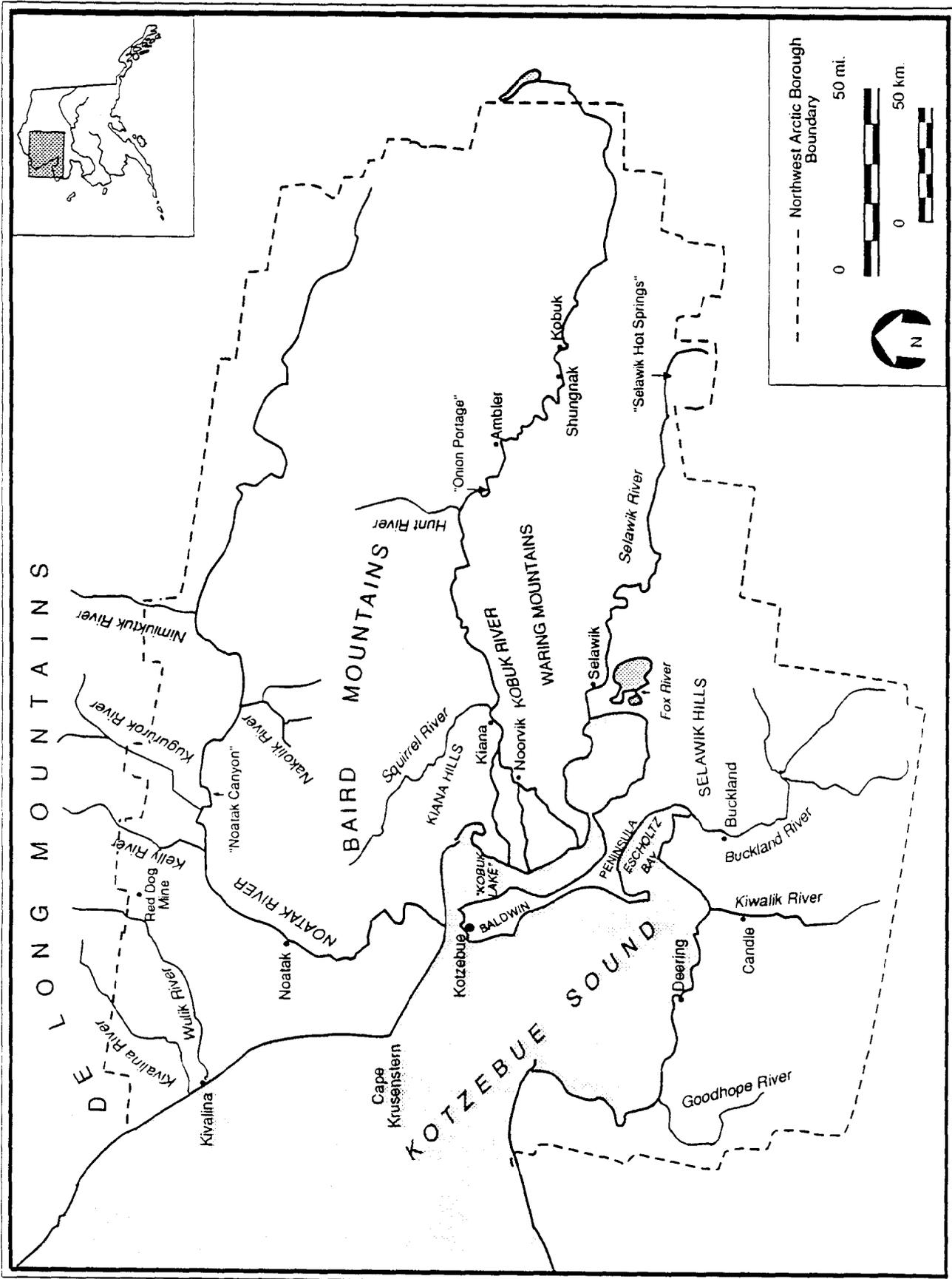


Fig. 2. Geographic features and community locations in the Northwest Arctic Borough.

When the water surrounding Kotzebue freezes, the climate changes to a continental type. The average normal monthly temperature for December, January, and February is -4 degrees Fahrenheit. The record low is -52 degrees. Although winter temperatures are relatively mild compared with interior Alaska temperatures, frequent winds create severe wind chill. Nonetheless, many Kotzebue residents travel long distances throughout the winter, camping, hunting, and visiting other communities. Mobility is enhanced in winter when water and land become equally traversable.

In all seasons, wind is a predominant feature of Kotzebue's weather. Mean hourly wind speeds vary from 10 miles per hour in May to 15 miles per hour in January. In winter, wind combined with cold temperatures creates extreme wind chill, but in summer the wind keeps the coast relatively free of mosquitoes. Annual precipitation in Kotzebue is light with eight inches the total for a normal year. More than half of that falls in July, August, and September. Snow generally falls in every month except July and August, but the average snowfall per year is less than 50 inches (U.S. Department of Commerce 1983). Freeze-up in Kotzebue Sound usually occurs in mid-October, with breakup taking place in late May or early June.

Kotzebue is located in a region of continuous permafrost. Vegetation in the Kotzebue vicinity consists primarily of grasses, mosses, sedges, dwarf shrubs, and lichens. Willows are found in protected areas along creeks. Although the Baldwin Peninsula is essentially treeless, Kotzebue is not beyond the arctic treeline. The boreal forest extends another 75 miles to the north of Kotzebue along the Noatak River.

With its northern latitude, Kotzebue enjoys round-the-clock daylight in late spring and early summer. The sun officially does not set between June 2 and July 9. During these long hours of daylight Kotzebue rarely sleeps. Children play in the streets late into the night, sometimes losing track of whether it is afternoon or evening. Boats travel through the sound at all hours of the day; the streets are seldom empty of pedestrians. Those who must be at work in the morning struggle to get enough sleep amid all the activity.

In midwinter, the converse is true. On the shortest day of the year, Kotzebue officially has one hour and 42 minutes of daylight, but extended twilight at dawn and dusk stretches the usable light to about five hours. In midwinter, the sun is low in the sky, casting long shadows and coloring the landscape in soft pastels. The days lengthen quickly after the turn of the year and by late March the snow is a brilliant white, the sky a deep blue, and daylight lasts again for 12 or more hours.

FLORA AND FAUNA

Despite its barren appearance to the newcomer, Kotzebue's marine and terrestrial environment is in fact rich and varied in its flora and fauna. Large terrestrial mammals inhabiting the Kotzebue Sound region include caribou, moose, Dall sheep, brown bear, black bear, and musk oxen. Smaller mammals include beaver, muskrat, marmot, porcupine, wolf, red and arctic fox, lynx, marten, mink, land otter, and wolverine. Two species each of hare, squirrel, and weasel also live in the area as well as several less distinguishable species of shrews and voles.

As in most northern latitudes, birds have tremendous seasonal fluctuations. In winter only a handful of bird species reside in the Kotzebue Sound region. Ravens, ptarmigan, grosbeaks, buntings, and redpolls are the most commonly seen in the Kotzebue area in winter. In timbered areas along river systems gray jays, chickadees, goshawks, grouse, woodpeckers, and owls are found year-round. Gyrfalcons, snowy owls, dippers, and crossbills also winter in the region. Seabirds can occasionally be seen in early winter along offshore ice leads. All in all, however, the winter skies are quiet, broken only by the call of the raven, the clucking of ptarmigan, or the evening hooting of an owl.

The contrast in late spring and summer is enormous. The skies come alive. Everywhere one goes -- on the ocean, along lakes or rivers, in the tundra -- the movements and sounds of birds abound. Waterfowl, shorebirds, songbirds, raptors, and others return to the region in stunning numbers to breed, nest, or pass through on their migratory routes. According to the U.S. Fish and

Wildlife Service, 160 species of birds are found on the nearby Selawik National Wildlife Refuge and in the surrounding area (U.S. Department of the Interior 1987:256-259).

Marine resources are also readily available in Kotzebue. Most prominent are the marine mammals, 11 species of which occur in the region. Bearded seals are abundant in spring in Kotzebue Sound. Beluga whales are common in the sound in summer; spotted seals in summer and fall. Ringed seals are the only marine mammal abundant in the area in winter and early spring. Although not common, killer whales, minke whales, and harbor porpoises are occasionally seen. Polar bears, gray whales, bowhead whales, and walrus primarily pass through the western portion of the sound during their spring and probably fall migrations, usually too far offshore to be frequently seen by Kotzebue residents (Frost and Lowry 1986:1). Ribbon seals are also occasionally sighted, but these generally do not inhabit Kotzebue Sound, living instead further offshore in the Chukchi Sea.

The marine waters, estuaries, lakes, and rivers in the Kotzebue area provide habitat for a variety of fish. Chum salmon comprise the overwhelming majority of salmon in Kotzebue Sound with four other species (chinook, sockeye, coho, and pink) present in small numbers. Sheefish, whitefish, herring, smelt, arctic cod, saffron cod, sucker, sculpin, and flounder at least seasonally inhabit coastal waters near Kotzebue. Other freshwater fish include northern pike, arctic grayling, blackfish, stickleback, and burbot. Dolly Varden migrate through Kotzebue Sound on their way to and from the Noatak, Kivalina, and Wulik River systems. Shellfish, in particular, clams, crab, and mussels, are also found in Kotzebue Sound.

Edible floral resources are dominated by berries. The most prominent of these are salmonberries, blueberries, cranberries, and crowberries, although other species are utilized as well. Willow, fireweed, sourdock, wild celery, Labrador tea, and Eskimo potato are locally popular greens and roots for gathering.

Perhaps one of the most significant aspects of the fauna of northwest Alaska is that all major resource species are seasonal migrants, including marine mammals, caribou, waterfowl, salmon, sheefish, char, and many other fish species. Thus, for many resources, Kotzebue hunters and

fishers have a limited window of time in which to harvest a particular resource, and in many cases must go to great lengths to preserve enough to last until the following year.

In addition to this seasonality, many resources in the Kotzebue area also undergo occasional radical shifts in abundance from one year to the next. Other resources have fairly stable populations, but their availability to hunters changes considerably from year-to-year as a result of environmental factors such as weather and ice conditions. In the past, these ecological conditions from time to time coalesced in such a way as to cause local or regional famine. Although famine might no longer be a threat in the 1980s, these ecological conditions still lead to large annual variations in a community's subsistence harvests.

PREHISTORY AND HISTORY

Archeological findings in northwest Alaska indicate that people have continuously occupied the Kotzebue Sound area for the past 4,000 years. Evidence from the oldest sites shows that humans were in the area 6,000 years ago, and perhaps as early as 8,000 to 10,000 years ago (Giddings and Anderson 1986:311). Although North America has probably been inhabited by people for at least 20,000 years, if not longer, no conclusive evidence has been found showing human occupation in arctic Alaska prior to 11,000 years ago (Anderson 1984:80).

Two cultural traditions can generally be described for the period of continuous occupation in the Kotzebue Sound area: 1) the Arctic Small Tool tradition (4,200 to 1,000 years ago) during which the earliest known sea mammal hunting in northwest Alaska developed, and 2) the Northern Maritime tradition (1,400 years ago to present) during which the Eskimo culture as it was encountered historically developed (Giddings and Anderson 1986:313). Although the Arctic Small Tool tradition had Eskimo-like subsistence patterns, its artifact styles differed from the Northern Maritime tradition, and thus the cultural link between the two is unclear (Giddings and Anderson 1986:311-317).

The area near present-day Kotzebue has been occupied as a village site for the past 600 years. The oldest excavated Kotzebue site, located on a beach ridge just south of the modern community, was dated at 1400 A.D. and another, slightly more distant site at 1550 A.D. (Giddings 1952:19-23). In the several hundred years before 1400 A.D., when whales and other sea mammals figured prominently in the local resource base, Kotzebue-area people lived in large settlements near prime whaling and sealing grounds in the Cape Krusenstern area. With the disappearance of whales from the area around 1400 A.D., settlements declined in size and people moved to the present-day Kotzebue vicinity where fishing provided a reliable resource base (Anderson 1984:92).

At the time of Euro-American contact in the 19th century, northwest Alaska was occupied by Inupiaq Eskimos in a number of relatively autonomous traditional societies, each of which controlled a certain territory in which family groups moved seasonally in conjunction with the subsistence cycle (Burch 1980). The territory of the Kotzebue people, or *Qikiqtaġruymiu*, included the upper two-thirds of the Baldwin Peninsula, the Noatak River delta, and the northern shore of Kotzebue Sound (Burch 1980:289). The *Qikiqtaġruymiu* followed a seasonal cycle of hunting and fishing, depending primarily on seals, beluga, caribou, birds, and fish.

In the first half of the 19th century, the main *Qikiqtaġruymiu* winter village, a comparatively large settlement, was located just south of present-day Kotzebue with smaller settlements scattered elsewhere in their territory. The estimated population of the *Qikiqtaġruymiu* in 1840 was 375 (Burch 1980:289). A favorable environment supporting marine mammals, land mammals, and fish provided greater stability to the *Qikiqtaġruymiu* than to inland societies and others inhabiting less productive areas. This allowed for a larger population among the *Qikiqtaġruymiu* and less seasonal movement in search of food than in some neighboring societies.

The productive Kotzebue environment also made possible an annual summer trade fair at *Sisualik*, a spit ten miles northwest of Kotzebue used by the *Qikiqtaġruymiu* and others for summer beluga hunting. Described as the largest regular Eskimo gathering in the world at the

time, this fair attracted 2,000 or more people from throughout northwest Alaska and as far away as Point Hope, Wales, the Diomedede islands, and the Asiatic mainland (Burch 1984:305) The fair, peaking in late July, included feasts, dancing, games, and intersocietal trade, the latter its dominant feature by the historic period. Interior people traded furs, jade, salmon skin clothing, and birchbark baskets for muktuk, seal oil, ivory, and walrus hides from coastal dwellers. Tobacco, metal implements, and firearms reached *Sisualik* through trade routes from Russia before Europeans arrived in the region (Smith 1966:21-22). Whaling ships later brought additional imported goods. Kotzebue was thus a major center of intercontinental trade in arctic Alaska long before its evolution into a 20th century regional trade and government center.

The Great Famine of 1882-84 decimated the *Qikiqtaġruṃmiut* (Burch 1980:279). Other forces, including introduced disease and loss of self-sufficiency as Euro-American influence grew, also worked at breaking down the traditional societies, sometimes quickly, sometimes gradually. The survivors of famine and disease regrouped as best they could, but nevertheless the traditional societies existing at the time of contact had broken down by 1910.

The first explorer to visit Kotzebue Sound was Otto von Kotzebue in 1816, although he mostly explored the southern sound and apparently did not come into contact with the *Qikiqtaġruṃmiut* (Grauman 1977:11-14; Smith 1966:103). Europeans continued to periodically visit inner Kotzebue Sound during the first half of the 19th century, most notably Captain F.W. Beechey of the *H.M.S. Blossom* in 1826 and T.E.L. Moore of the *H.M.S. Plover* in 1849-50, the latter in search of the lost John Franklin expedition. These limited contacts, however, brought little change to traditional *Qikiqtaġruṃmiut* life (Burch 1984:313). After 1850, foreign traffic increased in Kotzebue Sound as news spread of these earlier expeditions. Commercial interests in whales, ivory, and fur spurred the growing number of American trading vessels (Grauman 1977:27).

In the 20 years following 1880, change in the Kotzebue Sound area occurred rapidly. Famine and disease severely reduced Native populations. Explorations were undertaken of Kotzebue Sound's interior, with Lieutenant Stoney in 1885-86 becoming the first Euro-American

to winter along the Kobuk River. From 1880 to 1895 the United States stationed a Revenue Marine cutter in the Kotzebue area to provide assistance to American whalers and to police the trade in alcohol and firearms (Smith 1966:105).

In 1897, the Religious Society of Friends missionaries arrived, setting up living quarters at the site of present-day Kotzebue. Within a few years, frame and log houses, a school, a post office, and reindeer herding had been established by the missionaries, followed later by a hospital and a sizable church. By 1915, the Friends had established churches and schools in various locations throughout the region, many of which evolved into the permanent communities of today (Smith 1966:107-114; Burch 1984:314).

The missionaries were not the only newcomers to Kotzebue at the close of the 19th century. In 1898, more than a thousand gold seekers poured into Kotzebue on their way to inland gold fields, particularly along the Kobuk River. Inupiaq residents earned cash from the miners by building boats and dog sleds, providing meat and dried fish, hauling mail and freight, and manufacturing fur clothing (Smith 1966:111-113). By 1900, most of the miners had left, unsuccessful in finding their fortune (Foote 1966:17).

Kotzebue's position as a modern regional center did not solidly emerge until after World War II. Prior to 1930, other communities in the region had larger populations than Kotzebue. Census records show Shungnak as the largest community in 1910 and Noorvik as the largest in 1920 (Rollins 1978). Noorvik was also the original location of the government hospital built in 1916 (Smith 1966:113-115). In 1930, Noatak, Selawik, and Kotzebue were the largest communities in the region, all having populations of 200-300 (Rollins 1978). Kotzebue at this time was a fairly typical village, not too unlike the other large villages in the region.

During and after World War II, Kotzebue increasingly evolved into the region's hub, largely owing to the establishment of government facilities and services there. The government hospital was relocated to Kotzebue from Noorvik in 1938. In the early 1940s, the Civil Aeronautics Administration began operations in Kotzebue and built communication towers. Transportation services also expanded with the establishment of a barge company and the

construction of fuel storage facilities. In the 1950s Kotzebue was surveyed, house sites auctioned, and a new hospital constructed. Tourists began arriving. A commercial telephone company started operating. By the 1960s, the construction of an Air Force station a short distance away led to a growing military presence. A bank opened. A Bureau of Indian Affairs high school was built. These activities all provided wage employment, resulting in the in-migration of village residents from outlying areas as well as non-Natives from outside the region (Smith 1966:115-120).

The 1960s and 1970s brought political changes to Kotzebue as well as further growth. In 1966, the Northwest Alaska Native Association was formed to work towards a statewide settlement of Native land claims, which eventually culminated in the passage of the Alaska Native Claims Settlement Act (ANCSA) in 1971. From this emerged the NANA Regional Corporation and the Kikiktagruk Iñupiat Corporation of Kotzebue. Both these Native-owned corporations have invested in businesses and economic development projects in Kotzebue and in other parts of the state, providing many jobs to their shareholders.

Land status in the Kotzebue region has also been transformed since the early 1970s. As a result of ANCSA, the Kikiktagruk Iñupiat Corporation received title to much of the Baldwin Peninsula and parts of the Noatak and Kobuk River mouths. NANA Regional Corporation owns large sections of land throughout the region. In 1980, the Alaska National Interest Lands Conservation Act (ANILCA) created four new federal conservation areas near Kotzebue: Cape Krusenstern National Monument, Noatak National Preserve, Kobuk Valley National Park, and Selawik National Wildlife Refuge (Fig. 3). The agencies that manage these units -- the National Park Service and the U.S. Fish and Wildlife Service -- base their local operations in Kotzebue. In 1986, local voters approved the formation of the Northwest Arctic Borough whose boundaries correspond with those of the NANA Regional Corporation (Fig. 2). The borough also received a land entitlement from the state.

In the late 1980s, Kotzebue remained the transportation, communication, commerce, and service center for the Northwest Arctic Borough's ten outlying villages. Village residents were

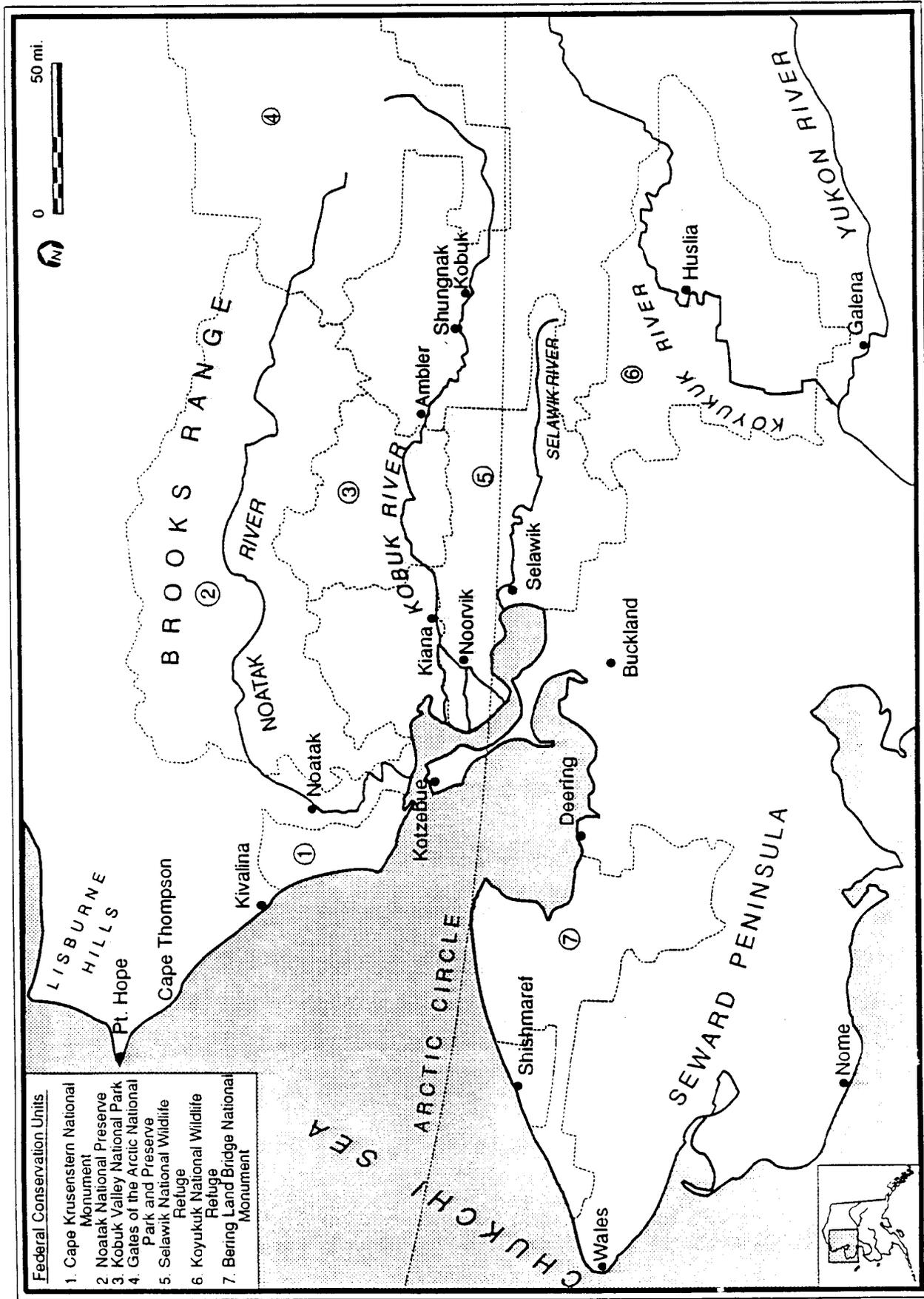


Fig. 3. Location of Kotzebue and federal conservation units in northwest Alaska.

regularly sighted on Kotzebue streets, in town for shopping, funerals, meetings, athletic events, job training, medical care, or simply to visit with friends and relatives. Nearly all mail and imported goods destined for the villages passed through Kotzebue, then were shipped on via barge or small airplane. All the region's government and social services were based in Kotzebue. The airport terminals in Kotzebue teemed with the comings and goings of the region's residents and with non-local technicians and consultants frequenting the region on business. The newly-opened Red Dog lead and zinc mine north of Kotzebue instilled economic optimism in northwest Alaska even at a time when recession gripped much of the state.

Kotzebue's emergence as the modern regional center of northwest Alaska was the result of its geography and history. Before the advent of air travel when waterways were critical transportation routes, Kotzebue's location on the coast near the mouths of the region's three major rivers gave it the advantage of a central location accessible to all the region's population. This geographical circumstance accounted in part for *Sisualik* being the location of the traditional summer trade fair (Burch 1984:305), and continued to be a factor in modern times.

Kotzebue's long-standing tradition as a trading crossroads perhaps also contributed in another way to its emergence as a modern regional center. Outlying village residents were accustomed to traveling to Kotzebue for commerce and festivities, and mingling there with people from other communities. These attitudes and practices likely eased Kotzebue's transition into a modern center.

Ultimately, however, a regional center develops as a result of economic opportunities that attract people from outlying settlements or from outside the region. A good location attracts transportation interests, which in turn attract government facilities and functions, which in turn attract services to support the growing population. This was apparently what happened in Kotzebue. Furthermore, no events or developments took place in Kotzebue Sound that unexpectedly redirected the growth of a regional center from what was naturally and historically a good location. This contrasted with the development of some other Alaska regional centers

such as Nome, whose location and growth were entirely shaped by the gold rush, or to highway communities such as Tok or Glennallen, whose development was the result of road construction.

CHAPTER 3

CONTEMPORARY SOCIOECONOMIC PROFILE

From the air, Kotzebue looks small, a compact collection of buildings on a low-lying, three-mile-long spit separating Kotzebue Sound from a lagoon. The town's boundaries are distinct with little development rambling into the surrounding hills. Outside town, the local road system totals less than 15 miles. For visitors from Anchorage or other large communities, Kotzebue must initially appear tiny and isolated, a vulnerable site along a treeless coast.

Coming into Kotzebue by snowmachine from the east on a winter day, Kotzebue appears quite differently. It seems large, much larger than any of the villages a traveler might be coming from. The trail from the east leaves the Kobuk River delta, crosses ten miles of frozen "Kobuk Lake" (Hotham Inlet), then climbs into the rolling tundra hills of the Baldwin Peninsula. Along the trail, one passes families headed to camp with heavily loaded sleds, young men whizzing by on their snowmachines, or a musher taking dogs out for a training run. Ten miles from Kobuk Lake, the trail crosses Kotzebue's drinking water supply, a tundra lake linked to town with insulated pipe. The trail then climbs a low hill where, at the crest, Kotzebue suddenly comes into view. From this perspective, the town seems big and busy, with its bright lights, blocks of buildings, and sounds of generators, snowmachines, and airplanes, perhaps a jet. On a snowmachine or dog sled in winter, it is easy to see that Kotzebue is a regional center of northwest Alaska.

Like much of rural Alaska, Kotzebue is not accessible by road. In the late 1980s, access from outside the region was usually by commercial jet aircraft from Anchorage, servicing the community with passengers and freight two to three times daily. Another air carrier offered twin-engine service between Fairbanks and Kotzebue six days per week. Travel between Kotzebue and the region's outlying communities was provided by four scheduled commuter

airlines, some of which also flew weekly routes to Nome and Barrow. In addition, Kotzebue had one seasonal and two year-round air taxi businesses in 1986.

As a regional center, Kotzebue offered many goods and services not available in the smaller, outlying communities. In 1986, these included a bank, a hotel, three grocery and dry goods stores, two hardware and lumber stores, two beauty salons, four restaurants, three snowmachine and all-terrain vehicle dealers, four taxi companies, a biweekly newspaper, a barge company, three auto repair garages, two fuel distributors, and seven churches. Kotzebue also supported a number of small businesses including a private law practice, fabric store, plumbing and heating repair service, travel agency, video rental store, janitorial service, and building contractor. The regional Native corporation (NANA) and the village Native corporation (Kikiktagruk Iñupiat Corporation) also had their headquarters in Kotzebue.

In the public and non-profit sectors, Kotzebue offered many additional services. These included a post office, hospital and clinic, dentist, optometrist, mental health counselors, alcohol and social services, community college, elementary and high schools, senior citizen center, prematernal home, technical training center, recreational center, and police and fire protection. Water, sewer, and garbage pick-up were provided by the city, while cooperatives ran the electric and telephone utilities. The State of Alaska had Kotzebue offices of the Departments of Transportation, Community and Regional Affairs, Labor, Fish and Game, Public Safety, Law, Corrections, and Military and Veteran Affairs. The federal government maintained the Federal Aviation Administration, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, and the National Weather Service.

Despite this seemingly wide array of businesses and services, Kotzebue nevertheless offered far less than urban centers such as Anchorage and Fairbanks. In Kotzebue, selections were limited and shortages common. Many items required special ordering at considerable expense and delay. Some small businesses operated erratically, opening and closing as their proprietors traveled and returned. The quality of some services was poor with few or no alternatives

available. Organized entertainment was scarce. In general, the goods and services available in Kotzebue were much less dependable and diverse than those available in metropolitan areas.

Housing in Kotzebue ranged from small plywood cabins without plumbing to large, two-story homes with picture windows, wall-to-wall carpeting, and other amenities found in American homes anywhere. New houses were interspersed among old ones, resulting in little neighborhood segregation based on income or material wealth. In summer, "tent cities" sprouted up along the waterfront at both the north and south ends of town; these were occupied by village residents who came to work in commercial fishing or seasonal construction and by Kotzebue residents seeking inexpensive and uncongested summer quarters. Offices and businesses were scattered around Kotzebue without one clearly identifiable business district. Kotzebue had no paved streets; snowmachines and all-terrain vehicles were more common street transportation than cars or trucks, although the numbers of the latter have been increasing.

POPULATION CHARACTERISTICS

As discussed in chapter 2, Kotzebue's position as the region's population center did not solidly emerge until after World War II. Between 1910 and 1939, Kotzebue's population increased by 93 percent from 193 to 372, but was still similar to other large communities in the region (Fig. 4). Between 1940 and 1950, however, Kotzebue's population increased 67 percent to 623 people and by 1960 had doubled again to 1,290. Much of this growth was due to migration from the surrounding communities, whose residents were attracted to Kotzebue for wage employment, proximity to the hospital and schools, and cosmopolitan living. Smith (1966:64) reported that 70 families migrated to Kotzebue between 1960 and 1965, mostly from the communities of Noatak, Noorvik, and Point Hope.

The rate of Kotzebue's population growth slowed in the 1960s and 1970s, but still continued to increase in absolute number. In 1980, Kotzebue's population was 2,054, at that time almost four times greater than the next largest community in the region. In 1984, Kotzebue's population

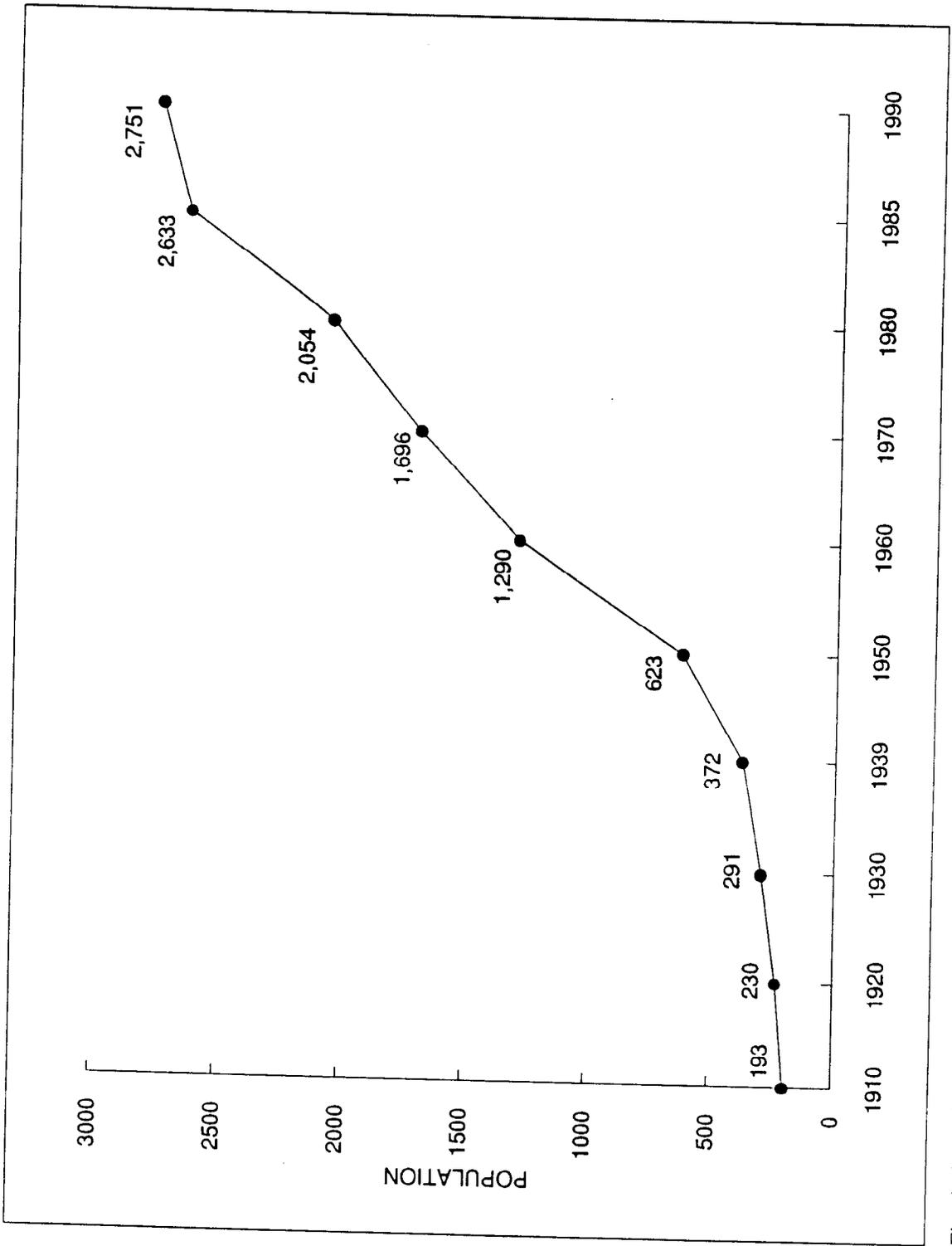


Fig. 4. Kotzebue population, 1910-90.

was estimated at 2,503 and in 1985 at 2,633, a 28.2 percent increase in five years (Alaska Department of Labor 1987:58). The 1990 population of Kotzebue was 2,751 (Alaska Department of Labor 1991:106). Expanded survey results from this study showed a population of 2,681 in Kotzebue in early 1987, although this did not count seasonal or temporary Kotzebue residents or persons in group quarters such as the jail, senior citizen center, technical center dormitory, and women's shelter. In 1985 an estimated 45.5 percent of the Northwest Arctic Borough's population lived in Kotzebue (Alaska Department of Labor 1986:58).

Additional demographic data collected by the 1986 survey included household size, year and place of birth, length of residency in Kotzebue, residence prior to Kotzebue, composition of household, and ethnicity of household. For a more complete summary of Kotzebue's demography, economy, and social institutions, readers are referred to Waring Associates (1988).

Survey results of the Division of Subsistence study showed that Kotzebue's mean household size in 1986 was 3.50 persons, similar to the 3.62 persons per household reported by the 1980 U.S. Census and the 3.54 persons per household reported by the 1990 U.S. Census (Alaska Department of Labor 1985:80; 1991:106). In 1986, two-person households comprised the largest percentage (28.6 percent) with more than half (57.9 percent) of all households having three members or less. Nearly three-fourths (72.6 percent) of Kotzebue households had less than five members (Fig. 5). At the other end, 17.5 percent of Kotzebue households had 6 to 15 members. According to survey results, adult men comprised 33.2 percent of Kotzebue's population, adult women 29.3 percent, and children under 18 years old 37.5 percent.

Survey results depicted a direct relationship between household size and harvest strata (see Methodology in Chapter 1). For example, 70.0 percent of Kotzebue's low-harvest households had 1-3 members, while only 20.0 percent of the high-harvest households were that size (Table 1). Conversely, households of 4-5 persons accounted for 43.4 percent of the high-harvest group, while only 16.7 percent of the low-harvest groups had households this large. The mean household size of the low-harvest group was 3.0 persons, of the medium-harvest group 4.3 persons, and of the high-harvest group 5.2 persons.

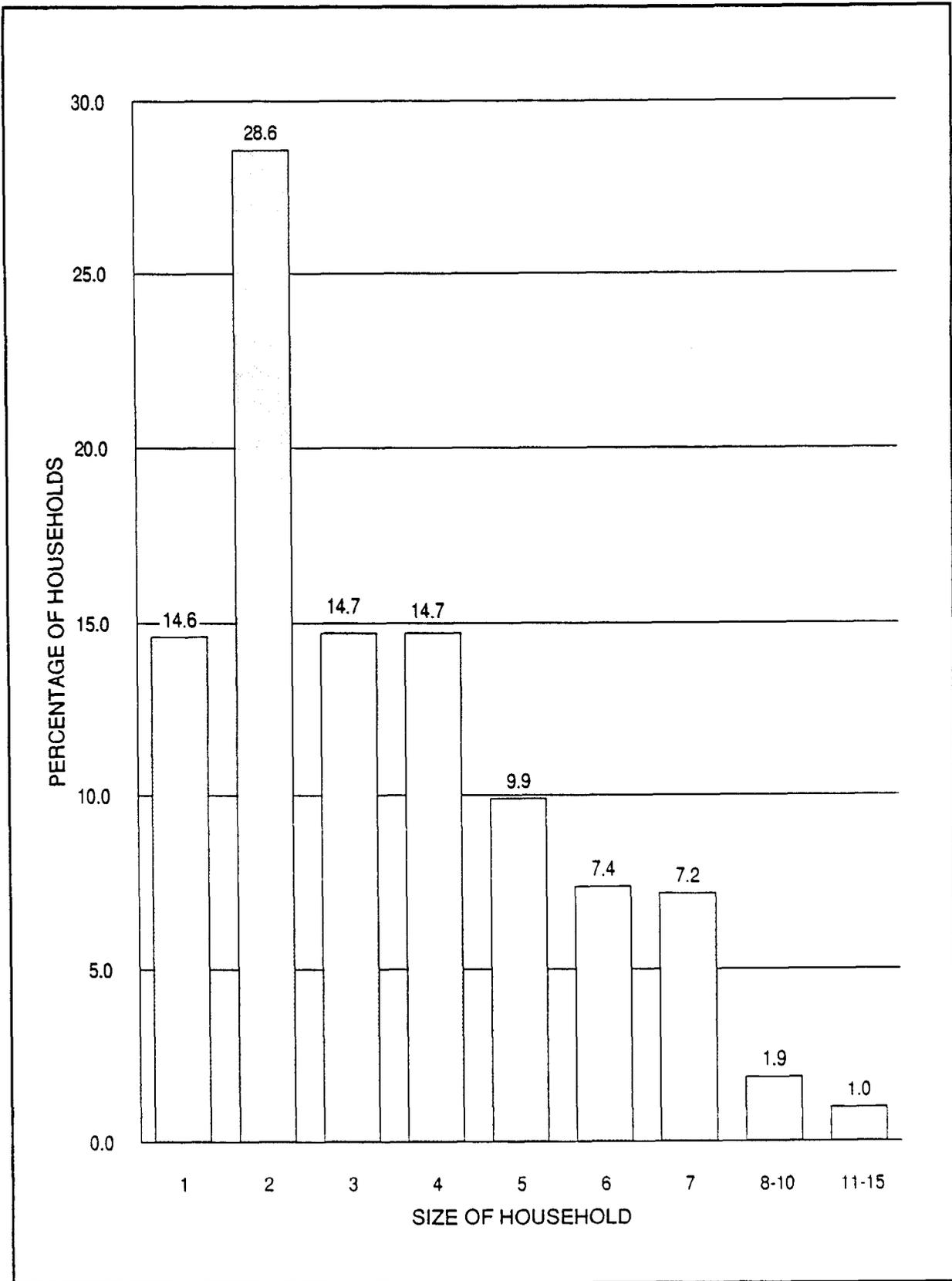


Fig. 5. Frequency of household sizes, Kotzebue, 1986.

TABLE 1. HOUSEHOLD SIZE BY HARVEST GROUP, KOTZEBUE, 1986.

Household size	Percent of households by harvest group		
	Low	Medium	High
1	20.0	3.3	3.3
2-3	50.0	36.7	16.7
4-5	16.7	40.0	43.4
6-7	13.4	13.3	23.4
8-10	0.0	3.3	9.9
11-15	0.0	3.3	3.3

Source: Division of Subsistence, ADF&G, household survey 1986.

TABLE 2. MEAN NUMBER OF MEN, WOMEN, AND CHILDREN PER HOUSEHOLD BY HARVEST GROUP, KOTZEBUE, 1986.

	Mean number per household by harvest group		
	Low	Medium	High
Adult men	1.0	1.4	1.7
Adult women	0.9	1.2	1.3
Children (<18 yrs.)	1.0	1.7	2.2

Source: Division of Subsistence, ADF&G, household survey 1986.

More adult men and women -- and not simply more children -- accounted for the larger household sizes of the medium- and high-harvest groups. For example, four or more adult men were present in 13.3 percent of high-harvest households, while no low-harvest households reported more than two adult men present. Table 2 lists by harvest group the mean number of men, women, and children per household.

Despite its population growth, Kotzebue in 1986 remained a predominantly Native community, indicating that its growth was more the result of natural increase and migration from the villages rather than migration from outside the region. The 1970 U.S. Census reported that 78.8 percent of Kotzebue's population was Alaska Native (Waring Associates 1988:261). In 1980, 76.6 percent was Alaska Native; in 1990, 75.1 percent was Alaska Native (Alaska Department of Labor 1985:80; 1991:107). Kotzebue was more ethnically mixed, however, than the region's other communities which in 1980 ranged from 79.6 to 100 percent Native (U.S. Department of Commerce 1983:223-225). In the Northwest Arctic Borough, Alaska Natives accounted for 83.2 percent of the population in 1988 (Alaska Department of Labor 1990:72). Expanded survey results from 1986 showed that 61.7 percent of Kotzebue's 765 households were Alaska Native (*i.e.*, household head or spouse was Alaska Native) while 38.3 percent of households were non-Native. The survey did not collect ethnicity information for every household member, and thus the ethnicity of Kotzebue's total population could not be calculated from this study.

In terms of length of residency, Kotzebue's population was polarized between transient, short-term residents and stable, long-term residents. The survey found that 38.3 percent of household heads and spouses had lived in Kotzebue either all their lives or for more than 20 years (Table 3). At the other end, a similar percentage (44.4 percent) had lived in Kotzebue for five years or less. Only 16.4 percent of household heads and spouses fell between these two extremes, having lived in Kotzebue 6 to 20 years. The mean length of residency in Kotzebue for household heads alone was 16.8 years.

TABLE 3. LENGTH OF RESIDENCY OF HOUSEHOLD HEADS
AND SPOUSES, KOTZEBUE, 1986.

Number of years	Percentage of household heads and spouses
1-2	23.6
3-5	20.8
6-10	6.3
11-20	10.1
21-30	7.2
31-40	8.5
41+	1.6
Lifelong	21.0
Unknown	0.9
Mean ^a	16.8

Source: Division of Subsistence, ADF&G, household survey 1986.

Characteristics of household heads and spouses (N = 1,229) were based on data obtained from 90 households in three sample groups. Data presented here were expanded in proportion to the sampling ratio.

(a) Includes household heads only.

As a regional center, Kotzebue differed from the area's smaller communities in the diverse origin of its inhabitants. Expanded survey results showed that 23.1 percent of Kotzebue's household heads and spouses were born in Kotzebue, 27.7 percent were born in other communities in the Northwest Arctic Borough or Point Hope, 6.2 percent were born in other parts of Alaska, and 43.0 percent were born outside Alaska (Fig. 6). Besides Kotzebue, Noatak and Noorvik were the birthplaces of more household heads and spouses than any other northwest Alaska community (Table 4). This was consistent with a report in 1966 that Noatak, Noorvik, and Point Hope accounted for much of Kotzebue's population that was derived from non-Kotzebue families (Smith 1966:64). Although 43.0 percent of Kotzebue household heads and spouses were born outside Alaska, only 24.7 percent moved directly to Kotzebue from other states, indicating that many people moving to Kotzebue came from other areas of Alaska (Table 4).

ECONOMY AND EMPLOYMENT

As the center for regional trade and services, Kotzebue had considerably more employment opportunities than the surrounding villages. Daily radio announcements typically listed numerous job openings in Kotzebue, ranging from kitchen help and laborers to public health nurses and controllers. Young adults from nearby communities were often attracted to Kotzebue for these job opportunities.

In 1986, government dominated Kotzebue's economy and employment opportunities. Kotzebue's private sector was limited, although tourism was on the rise, commercial fishing contributed significantly to the economy in some years, and the opening of the Red Dog mine near Kotzebue in the late 1980s promised a new source of private sector jobs.

Expanded results from the 1986 survey found that government directly provided employment to 69.4 percent of Kotzebue households. Local government, primarily the

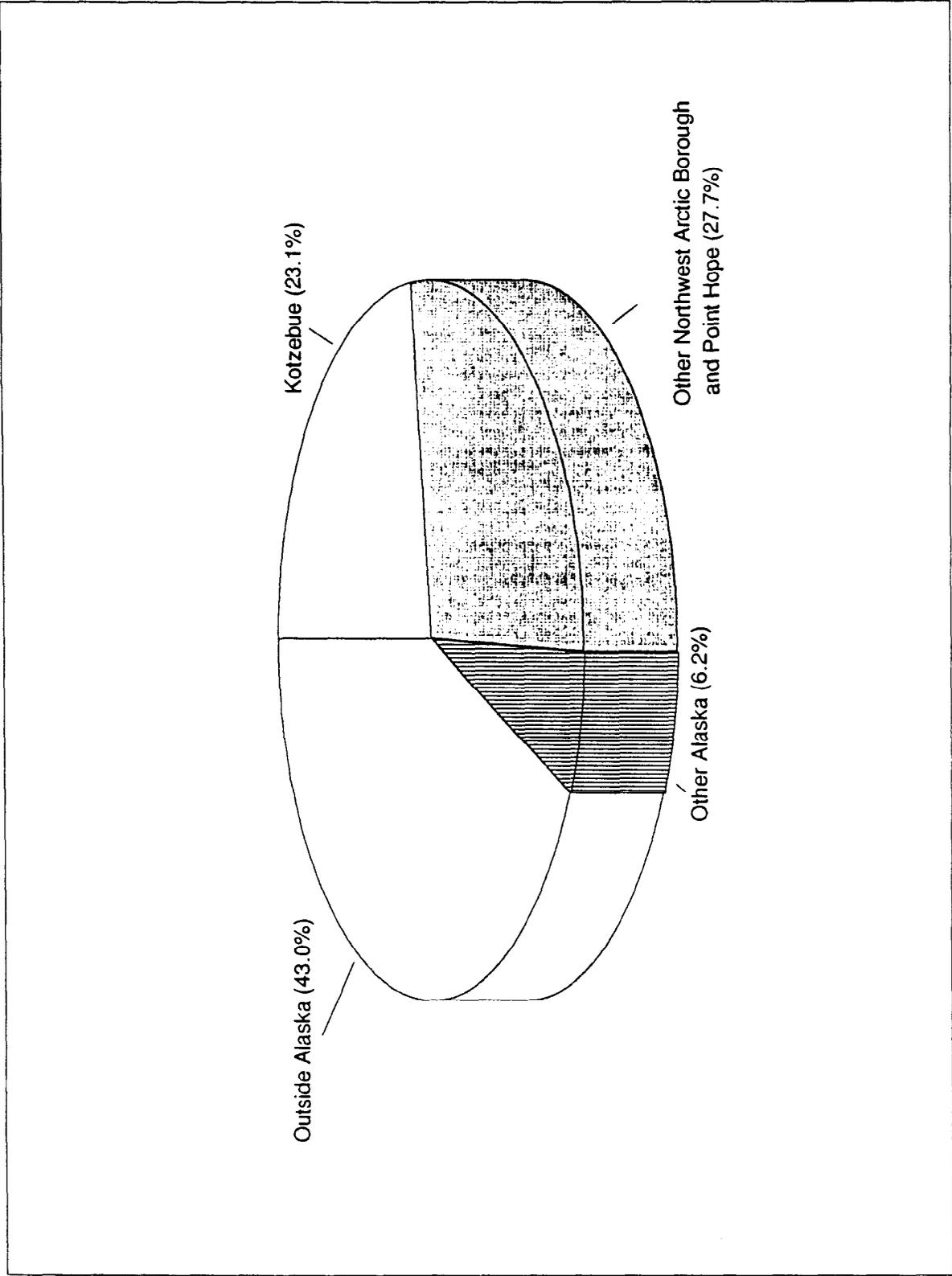


Fig. 6. Birthplace of household heads and spouses, Kotzebue, 1986.

TABLE 4. BIRTHPLACES AND PREVIOUS RESIDENCES OF
HOUSEHOLD HEADS AND SPOUSES, KOTZBUE, 1986.

Community	Percentage of household heads and spouses
Birthplace	
Kotzebue	23.1
Ambler	0.3
Buckland	0.7
Candle	0.9
Deering	1.4
Kiana	2.5
Kivalina	2.5
Kobuk	0.7
Noatak	6.4
Noorvik	5.5
Point Hope	4.3
Selawik	2.5
Bering Strait-Seward Peninsula region	2.2
Other Alaska	4.0
Outside Alaska	43.0
Previous Residence	
Lifelong Kotzebue	20.8
Other NW Arctic Borough or Pt. Hope	31.5
Other Alaska	22.6
Outside Alaska	24.7
Unknown	0.4

Source: Division of Subsistence, ADF&G, household survey 1986. Demographic characteristics of household heads and spouses (N = 1,229) were based on data obtained from 90 households in three sample groups. Data presented here were expanded in proportion to the sampling ratio.

Northwest Arctic Borough School District and the City of Kotzebue, accounted for most of these jobs, providing employment to 43.6 percent of Kotzebue households (Fig. 7). Another 16.4 percent of Kotzebue households had a person employed by the federal government, followed by 9.4 percent of households with a person employed by the state government.

Services followed government in providing jobs to Kotzebue households. This included the child care center and the many programs of the regional non-profit Maniilaq Association, many of which were supported by various state and federal grants. During the study year, 27.3 percent of Kotzebue households had someone employed in the service sector. Ranking third was trade: 16.5 percent of Kotzebue households had jobs in trade, which included grocery stores, snowmachine dealers, and hardware, dry goods, and building materials retailers. (See Appendix 4 for employer types included in each of these employment categories.) Following trade was commercial fishing which provided employment to 14.1 percent of Kotzebue households. Survey results showed that an estimated 12.0 percent of Kotzebue households owned limited entry fishing permits in 1986.

No other employment sector in 1986 provided more than ten percent of Kotzebue households with jobs (Fig. 7). The manufacturing sector largely consisted of self-employed individuals engaged in craft production, such as ivory carvers, sled builders, and skin sewers. Because many households had more than one job, the sum of the percentages in Figure 7 exceeds 100. The construction and start-up of Red Dog mine in the late 1980s provided many local residents with temporary or permanent employment and might have since altered Kotzebue's job composition.

Employment in most sectors was not related to harvest strata. The exceptions were manufacturing (craft production) and commercial fishing which were dominated by the high-harvest group (Fig. 8). Long-term Native families, some living seasonally in camps, tended to work in commercial fishing and manufacturing both because their skills fit these occupations and these occupations fit their seasonal cycle of subsistence activities.

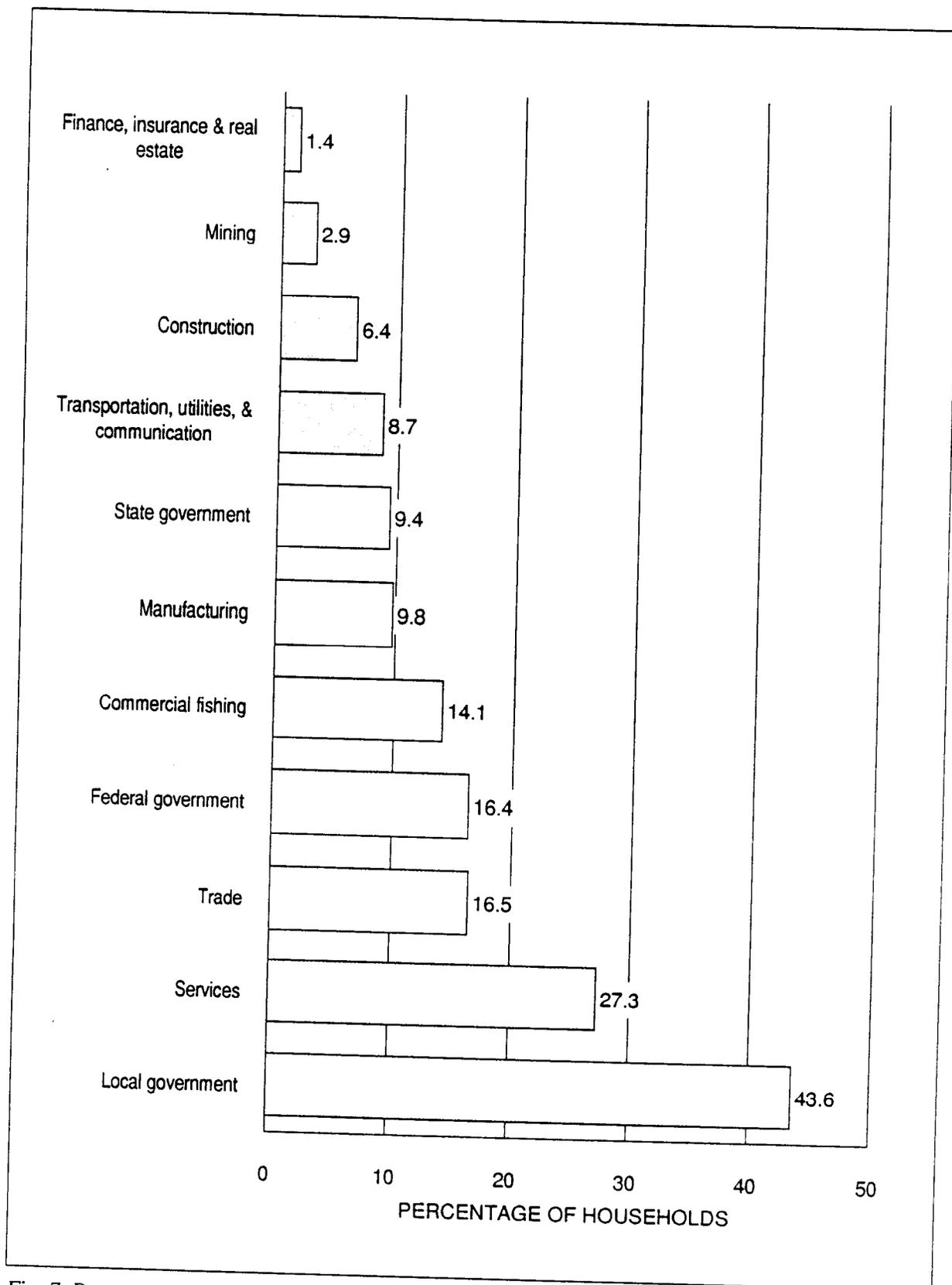


Fig. 7. Percentage of households employed by occupational category, Kotzebue, 1986.

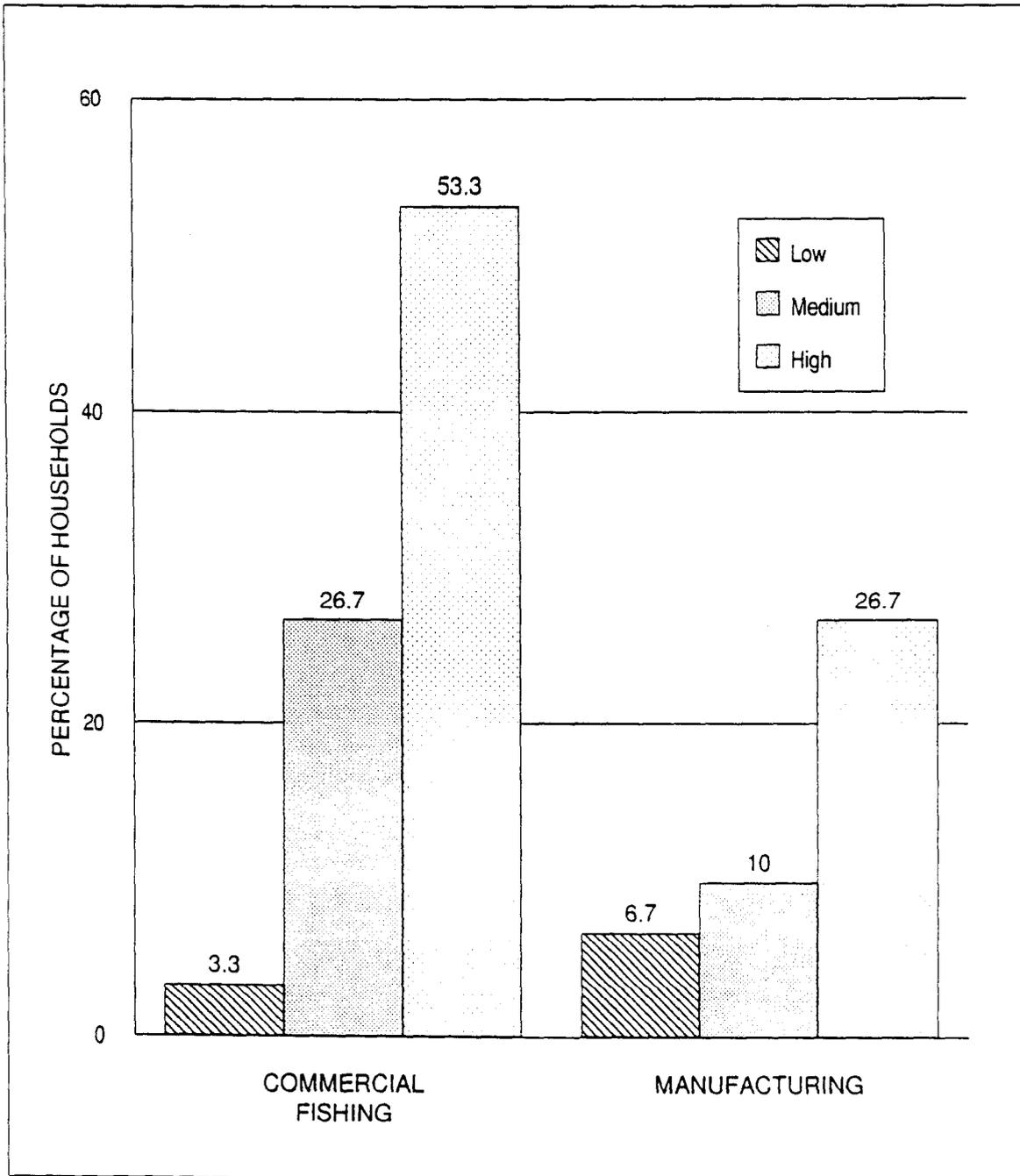


Fig. 8. Household employment in commercial fishing and manufacturing by harvest group. Kotzebue, 1986.

In 1986, almost one-half of Kotzebue households (47.9 percent) derived wage income from two jobs (Fig. 9). Another 16.8 percent of households held three or more jobs during the year. These might reflect one member of a household holding several seasonal or part-time jobs, several members of a household each holding one job, or a combination of the two. Almost one-third (31.9 percent) of Kotzebue households held one job; only 3.4 percent of households had no job. Kotzebue households held a mean of 1.8 jobs during the study year. Of the employed persons, more than three-quarters held one job in 1986 while 22.7 percent held two or more jobs (Fig. 10). Table 5 summarizes Kotzebue's employment characteristics in 1986.

In 1986, Kotzebue households had a mean of 62.5 weeks of employment (*i.e.*, the sum of all weeks worked by household members). More than 70 percent of Kotzebue households had the equivalent of 52 weeks or more of work during the study year (Fig. 11). About two-thirds of Kotzebue households had at least one person employed during each of the 12 months of the study year (Fig. 12).

Harvest group apparently had little relationship to the total number of weeks worked per household: the low-harvest group worked a mean of 64.9 weeks, the medium-harvest group 53.4 weeks, and the high-harvest group 64.7 weeks. Likewise, harvest group had little relationship to the number of different months in which a household had employment: the low-harvest group worked a mean of 10.2 different months, the medium-harvest group 8.9 months, and the high-harvest group 10.6 months. Harvest group, however, did bear on the number of jobs held by households during the study year. The high-harvest households held the most jobs per year (mean of 2.5), followed by the medium-harvest households (mean of 1.8), and the low-harvest households (mean of 1.7). This suggests that although the high-harvest households worked as long as the other harvest groups, their employment pattern tended to be more seasonal, involving multiple income-earning endeavors. This was perhaps partly a function of this group's high participation in commercial fishing, which in 1986 did not alone provide enough income to sustain most households.

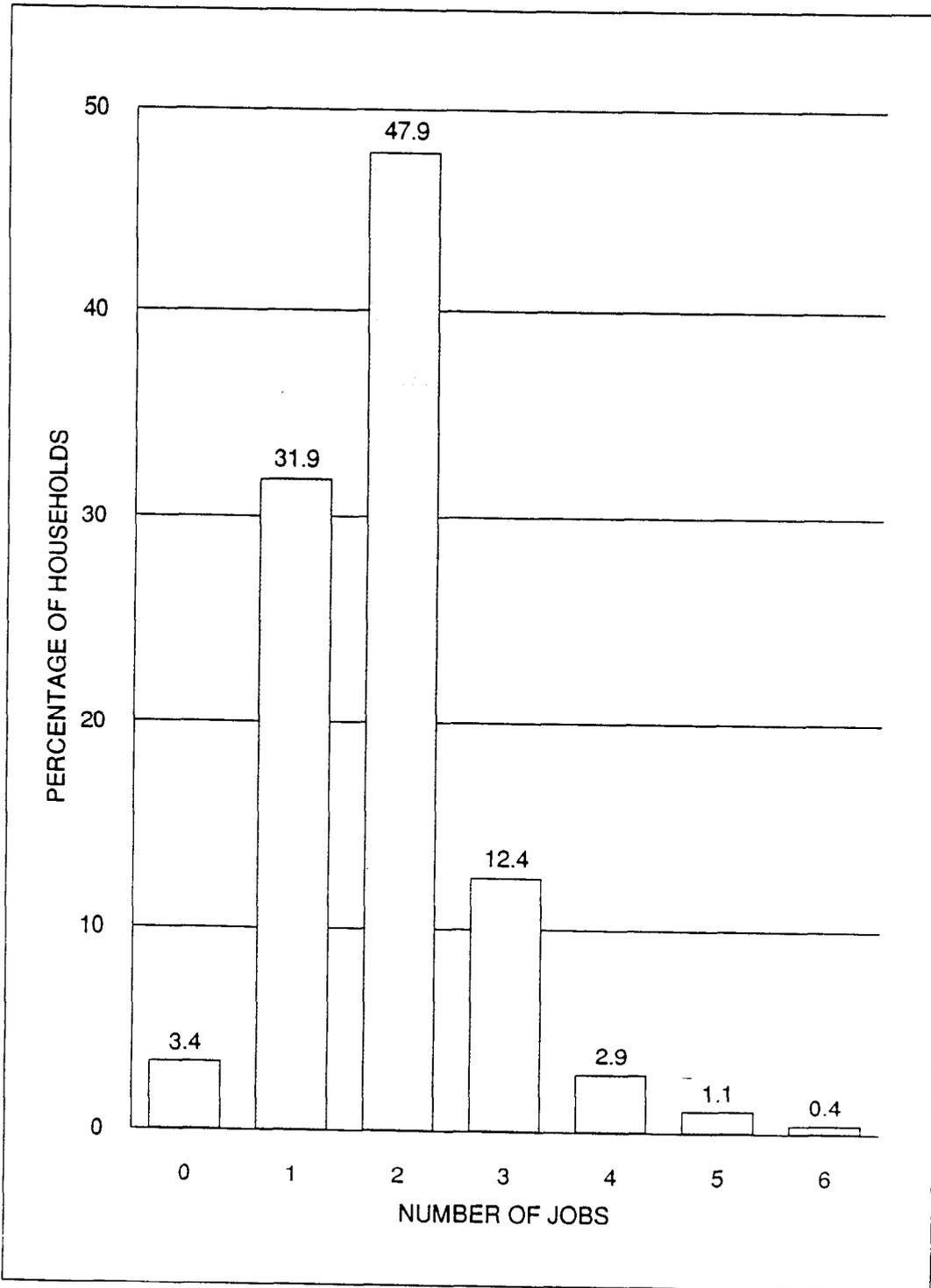


Fig. 9. Number of jobs held per household, Kotzebue, 1986.

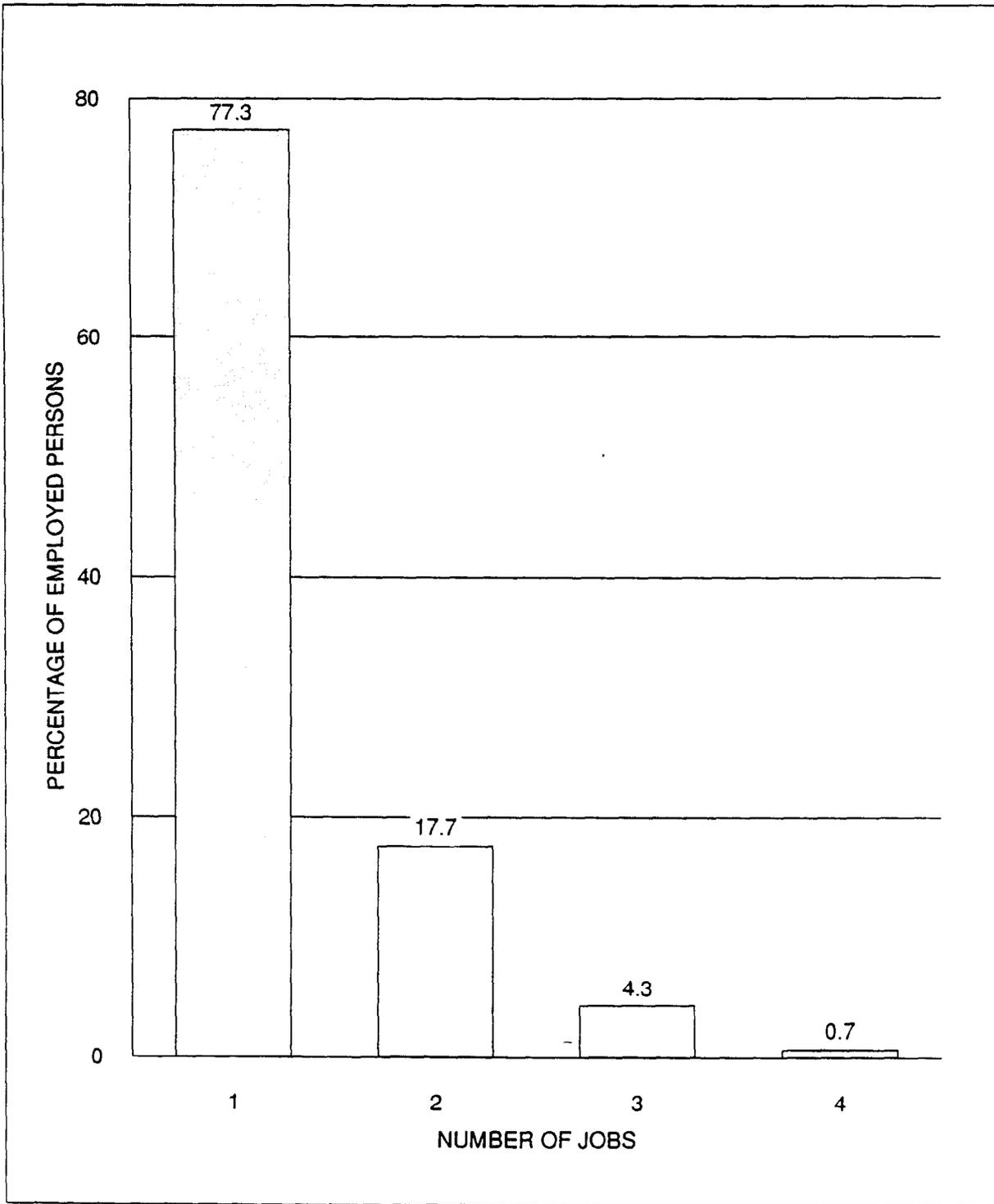


Fig. 10. Number of jobs held per year by employed persons, Kotzebue, 1986.

TABLE 5. EMPLOYMENT CHARACTERISTICS OF KOTZEBUE HOUSEHOLDS,
1986.

Households	
Total	765
Employed	739
Percentage	96.6
Jobs per household	
Mean	1.8
Minimum	0
Maximum	6
Weeks employed	
Mean	62.5
Minimum	0
Maximum	160

Source: Division of Subsistence, ADF&G, household survey 1986. Employment characteristics for the entire community (N = 765 households with 2,681 people) were based on data obtained from 90 households in three sample groups. Data presented here were expanded in proportion to the sampling ratio.

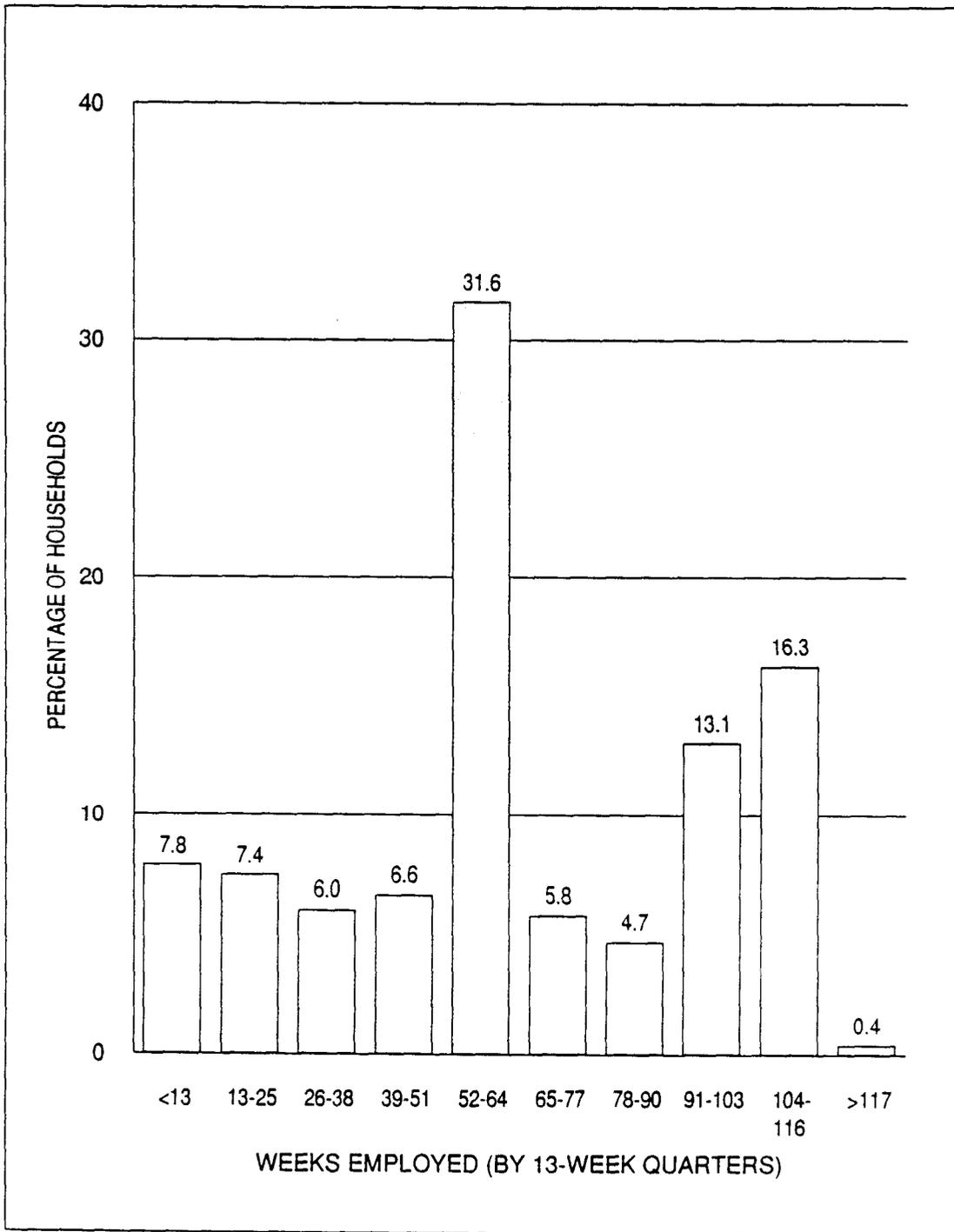


Fig. 11. Mean number of weeks employed per household, Kotzebue, 1986.

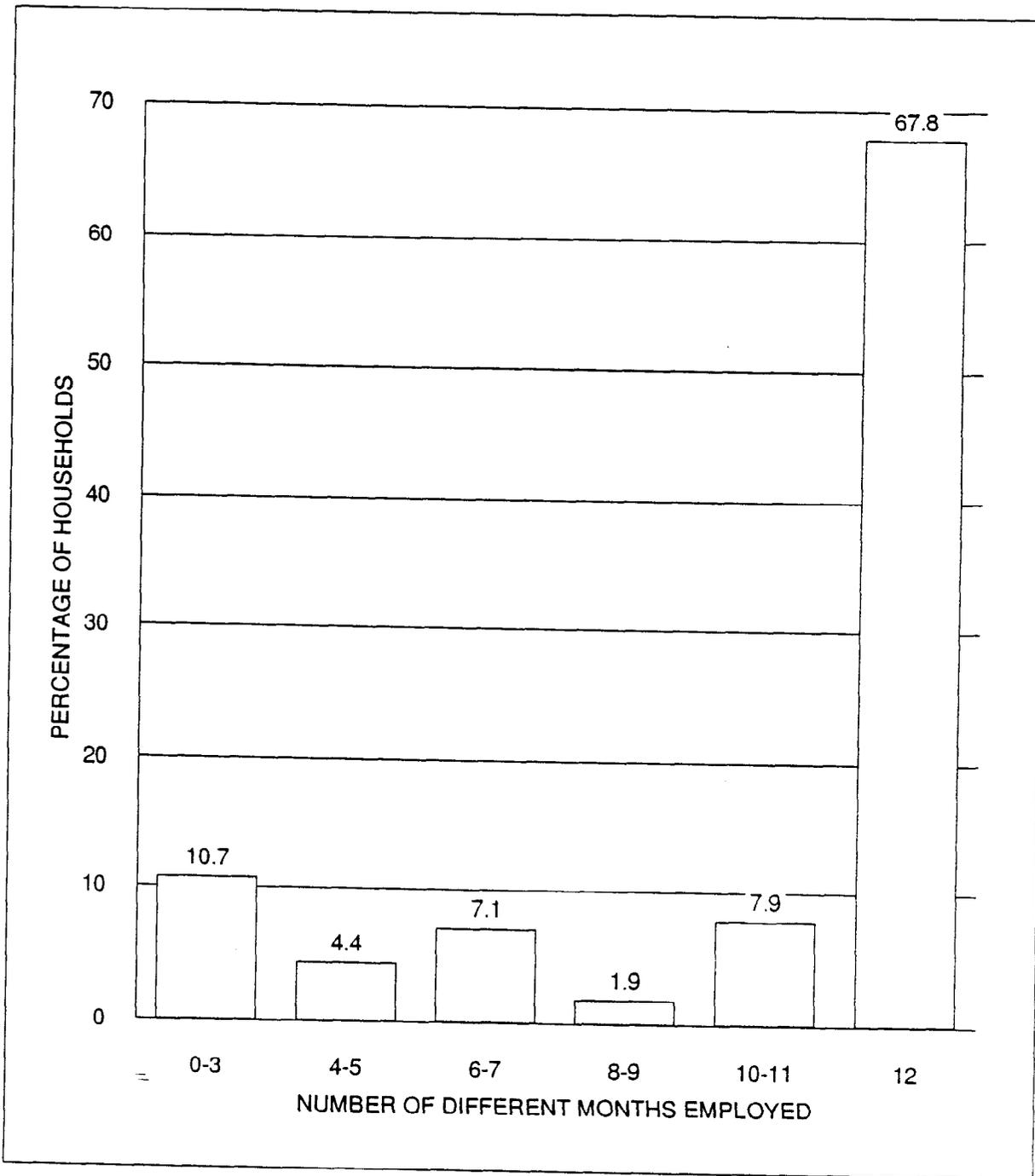


Fig. 12. Number of different months employed by households, Kotzebue, 1986.

In summary, Kotzebue's employment picture in 1986 was characterized by a predominance of government jobs, followed by jobs in the service sector. Trade and commercial fishing were also significant employment sectors. Nearly all households (96.6 percent) had at least some employment during the study year. More than two-thirds (67.8 percent) of Kotzebue households had at least one person employed during each of the 12 months of the study year and more than 70 percent had the equivalent of 52 weeks or more of work per year. Kotzebue's overall employment pattern was not highly seasonal, although this was not true for every household. Informal observations by researchers pointed to a common pattern in which one member of a household worked at a steady, year-round job while other members rounded out the household income with seasonal or part-time work over the year. Except for a few variables, such as participation in commercial fishing and mean number of jobs per household, employment patterns bore little relationship to harvest group.

Commercial Salmon Fishing

A summer set gill net salmon fishery was the only limited entry commercial fishery in Kotzebue Sound in the 1980s. This fishery, running from the second week of July until the end of August, targeted the chum salmon runs of the Noatak and Kobuk rivers. Kobuk River salmon arrived in Kotzebue Sound first, peaking in the commercial fishery in mid- to late July. Noatak River salmon, which were more abundant than the Kobuk River run, peaked in the commercial fishery in early to mid-August. Small numbers of sockeye, chinook, coho, and pink salmon also occurred in Kotzebue Sound, but their contribution to the commercial fishery was negligible. Dolly Varden were incidentally caught and sometimes sold in the last weeks of the salmon fishery. Between 1975 and 1986, the annual total chum salmon catch for the commercial fishery ranged from 111,533 to 677,239 fish (Table 6) (Merkouris and Lean 1988:70). In 1986, fishing periods in July were opened and closed by emergency order, while in August two 36-hour

TABLE 6. COMMERCIAL CHUM SALMON CATCH AND VALUE, KOTZEBUE DISTRICT, 1962-86.

Year	Total catch (number of fish)	Number of permits fished	Average catch per permit holder (number of fish)	Average price per pound (dollars)	Gross value of total catch (dollars)	Average earnings per permit holder (dollars)
1962	129,948	84 ^a	1,547	0.35 ^b	45,500	542
1963	54,445	61	893	0.35 ^b	9,140	150
1964	76,499	52	1,471	0.45 ^b	34,660	667
1965	40,025	45	889	0.45 ^b	18,000	400
1966	30,764	44	699	0.11	25,000	568
1967	29,400	30	980	0.11	28,700	957
1968	30,212	59	512	0.14	46,000	780
1969	59,335	52	1,141	0.15	71,000	1,365
1970	159,664	82	1,947	0.15	186,000	2,268
1971	154,956	91	1,781	0.16	200,000	2,198
1972	169,664	104	1,631	0.17	260,000	2,500
1973	375,432	148	2,537	0.25	925,000	6,250
1974 ^c	627,912	185	3,394	0.34	1,822,784	9,853
1975 ^d	563,345	267	2,110	0.28	1,365,648	5,115
1976	159,656	220	726	0.41	580,375	2,638
1977	195,895	224	875	0.56	1,033,950	4,616
1978	111,533	208	536	0.57	575,260	2,766
1979	141,545	181	782	0.80	990,263	5,471
1980	367,284	176	2,087	0.46	1,446,633	8,220
1981	677,239	187	3,622	0.53	3,246,793	17,363
1982	417,790	199	2,099	0.51	1,961,518	9,857
1983	175,762	189	930	0.25	420,736	2,226
1984	320,206	181	1,769	0.44	1,148,884	6,347
1985	521,406	189	2,759	0.47	2,137,368	11,309
1986	261,436	187	1,398	0.41	931,241	4,980

(a) During 1962-66 and 1968-71 data are the number of vessels licensed to fish, not the number of fishermen.

(b) Price per fish.

(c) Includes 6,567 chum salmon from the Deering experimental fishery.

(d) Includes 10,704 chum salmon from the Deering experimental fishery.

Source: Merkouris and Lean 1988:66-68.

openings per week were allowed. Legal gear was set gill nets not exceeding 150 fathoms in length.

Commercial salmon fishing in the Kotzebue area first occurred in 1914-18 when a packing company processed canned and salted salmon. The current commercial fishery originated in 1962 with a harvest of about 130,000 fish. In its first ten years (1962-71), an average of 60 fishermen participated in the fishery (Table 6). Excellent salmon returns in 1973-75 contributed to increased fishing effort with an average of 200 fishermen per year. Limited entry went into effect in 1976 with 219 permits ultimately issued for the Kotzebue Sound salmon fishery (Alaska Commercial Fisheries Entry Commission 1991:14, 187).

Compared with some other commercial salmon fisheries in Alaska, the Kotzebue Sound fishery was local, small scale, and minimally capitalized. In 1988 (1986 data not available), 69.4 percent of the fishery's permit holders were Kotzebue residents, and another 19.2 percent resided in the region's other communities (Fig. 13). Only 8.7 percent of the permit holders lived in other areas of Alaska, and 2.7 percent resided outside Alaska. Between 1980 and 1986, the median price for permits for this fishery ranged from \$7,750 to \$14,500. In 1986, permits sold for a median price of \$10,708 (Alaska Commercial Fisheries Entry Commission 1991:107). Most commercial fishermen used open skiffs 22 to 24 feet in length with outboard motors of 75 to 175 horsepower. Typical commercial salmon gear was 150 fathoms of six-inch mesh gill net.

The Kotzebue commercial fishery was not particularly lucrative for most fishermen in most years. Some fishermen hardly considered it a commercial enterprise, but rather a way to cover the expense of owning a boat, which they then used for hunting, fishing, camping, and general transportation. In 1989, when fishing was particularly poor due to low prices, many fishermen chose instead to work at Red Dog mine. Between 1975 and 1986, average annual earnings from commercial salmon fishing ranged from \$2,226 to \$17,362 per permit holder with an average of \$6,742 per season for this 12-year period (Table 6). In 1986, permit holders earned an average of slightly less than \$5,000 in the Kotzebue commercial salmon fishery (Merkouris and Lean 1988:66-68).

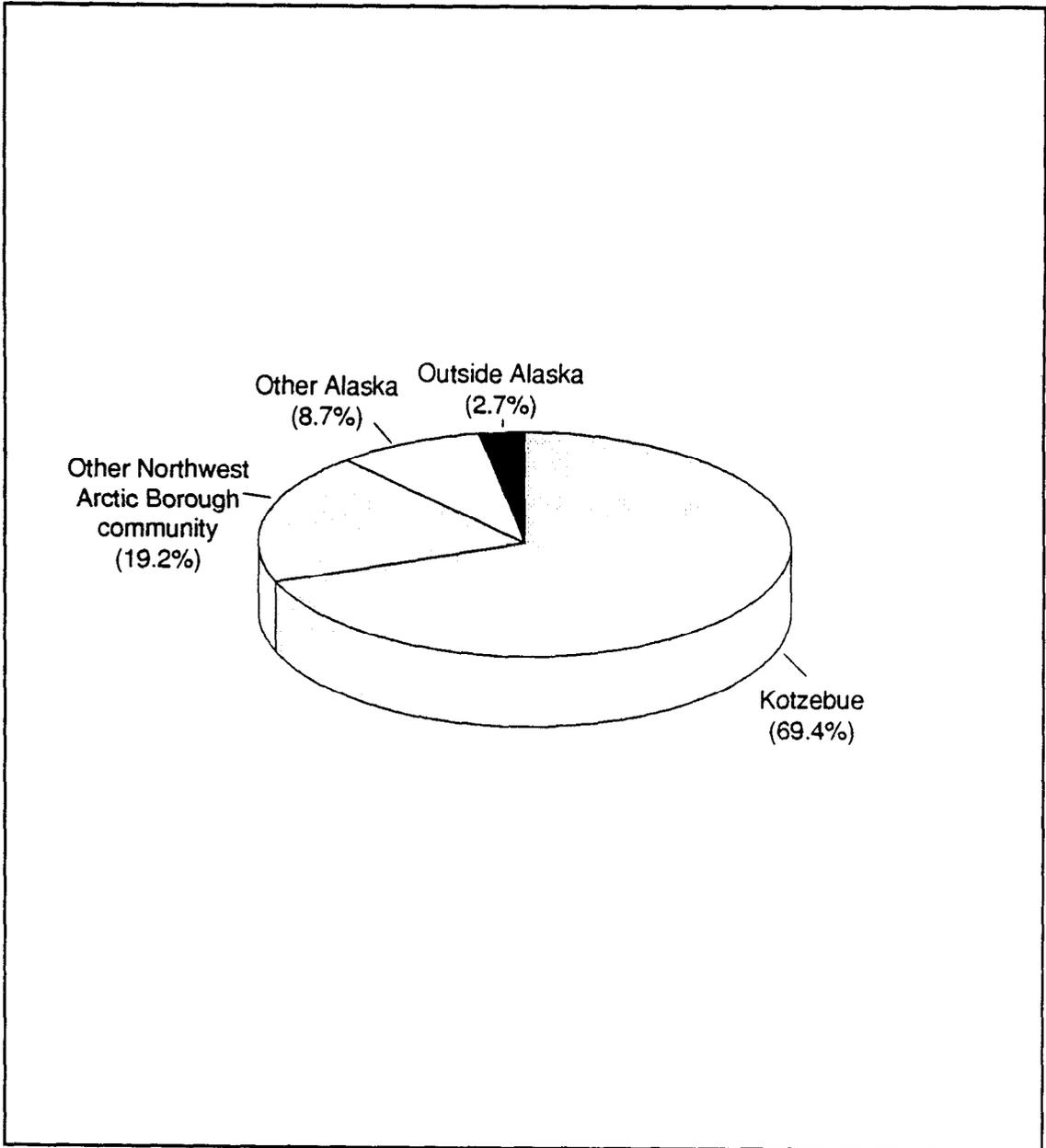


Fig. 13. Residence of Kotzebue Sound commercial salmon fishing permit holders, 1988 (N=219).

Commercial Sheefish Fishing

A commercial fishery for sheefish has operated in Kotzebue Sound since the 1960s, but it has been of such small magnitude as to have had little economic impact on the community as a whole. In the mid-1980s, this fishery opened October 1 and closed when a harvest quota of 25,000 pounds was reached. In most years, the quota was not reached and the fishery remained open all winter. Fishermen used gill nets set under the ice with mesh size ranging from 5-1/2 to 8 inches (in 1988 mesh size was restricted to 7 inches or less). Many fishermen participating in this commercial fishery also caught sheefish for subsistence purposes, selling their surplus for extra cash. Sheefish were usually sold directly by commercial fishermen to local residents, although some were also sold to grocery stores in Kotzebue, Nome, and Anchorage. In 1986-87, whole frozen sheefish sold in Kotzebue for \$0.49 per pound (Table 7). Only three fishermen obtained permits from ADF&G in 1986-87 to commercially sell sheefish. A total of 670 fish or 5,414 pounds were sold that year by permit holders (Merkouris and Lean 1988:143). Department biologists considered this harvest figure a minimum estimate because undocumented commercial sales in the local area were believed to be significant. A lack of markets outside northwest Alaska has limited the scale of the Kotzebue sheefish fishery. Table 7 summarizes Kotzebue's commercial sheefish harvest from 1966 through 1986.

INCOME

For most households, living in Kotzebue was not easy without a fairly stable source of cash income. Housing costs in particular were high. Some long-term Kotzebue residents owned their homes outright, while others reduced their housing costs by living without plumbing or in low-income housing. Many others, however, had to rent or buy housing at standard market rates. In the late 1980s, monthly rents in Kotzebue for housing units with water and sewer generally ranged from \$600 to \$1,200, requiring a substantial monthly income to meet expenses. Village

TABLE 7. WINTER COMMERCIAL SHEEFISH HARVEST, KOTZEBUE, 1966-86.

Year	Number of permit holders	Number of fish	Total pounds	Average weight per fish	Price per pound
1966-67	NA	4,000	26,000	6.5	1.30 ^a
1967-68	10	792	4,752	6.0	0.22
1968-69	17	2,340	15,209	6.5	0.25
1969-70	NA	2,206	NA	NA	0.14
1970-71	4	73	720	9.7	1.30 ^a
1971-72	5	455	23,201	6.4	0.16
1972-73	11	2,322	15,604	7.3	0.20
1973-74	6	NA	6,265	5.8	0.30
1974-75	NA	NA	24,161	9.5	0.30
1975-76	14	2,633	19,484	7.4	0.30
1976-77	2	566	5,004	9.0	0.30
1977-78	11	2,879	26,200	9.8	0.40
1978-79 ^b					
1979-80	4	1,175	8,225	7.0	0.50
1980-81	1	278	1,836	6.6	0.75
1981-82	11	2,629 ^c	17,376	NA	0.75
1982-83	8	1,424	13,395	9.4	0.50
1983-84	5	927 ^d	10,403	11.2	0.55
1984-85	4	342 ^d	3,902	11.4	0.51
1985-86	2	26	312	12.0	0.75
1986-87	3	670	5,414	8.1	0.49

NOTE: Data are not exact. In some instances total catch poundages were determined from average weight and catch data. Similarly, various price per pound figures were determined from price per fish and average weight data.

(a) Price per fish.

(b) No reported commercial catches.

(c) Estimate based on historical average weight.

(d) Number of fish not always reported. Estimates were based on average weight from reported sale which documented the number of fish.

Source: Merkouris and Lean 1988:143.

and camp residents who moved to Kotzebue frequently commented on Kotzebue's high cost of living and sometimes found they could not afford to stay.

Expanded results from the 1986 survey found that Kotzebue households had a mean of \$38,668 in earned income in 1986. The low-harvest group had the highest mean household earnings at \$42,127, followed by the high-harvest group at \$33,028, and the medium-harvest group at \$30,607.

Social Security, retirement, and longevity bonus payments accounted for a mean of \$1,269 per household in 1986, while transfer payments (unemployment, Adult Public Assistance, and Aid to Families with Dependent Children) accounted for an additional \$493 per household. These raised Kotzebue's total mean household income in 1986 to \$40,431. (Not included in this estimate was income obtained from interest, dividends, capital gains, rents, inheritances, and the like.) Reporting a mean household income from Social Security, retirement, longevity bonus, and transfer payments obscures the fact that most Kotzebue households received none of these. Only 10.3 percent of households received transfer payments during the study year, while 13.3 percent received Social Security, retirement, or the longevity bonus.

The expanded survey data showed that roughly one-third of Kotzebue households had annual incomes of less than \$30,000, one-third had annual incomes of \$30,000 to \$49,999, and one-third had annual incomes of more than \$50,000 (Fig. 14). More households had incomes between \$40,000 and \$49,999 than in any other income range. At the high and low ends, 21.0 percent of Kotzebue households had incomes less than \$19,999 while 20.1 percent had incomes of \$60,000 or more. The mean household income of \$40,431 hides these disparities at the upper and lower ends. Persons employed in government, transportation, communications, and utilities earned the highest annual wages, in part because these positions tended to be year-round as well as had higher salaries than other occupational categories (Fig. 15).

Household incomes in Kotzebue were significantly higher than those in the surrounding villages, a result of the regional center's greater wage employment opportunities. Although comparable village data from 1986 were not available, tax return data from 1985 demonstrate the

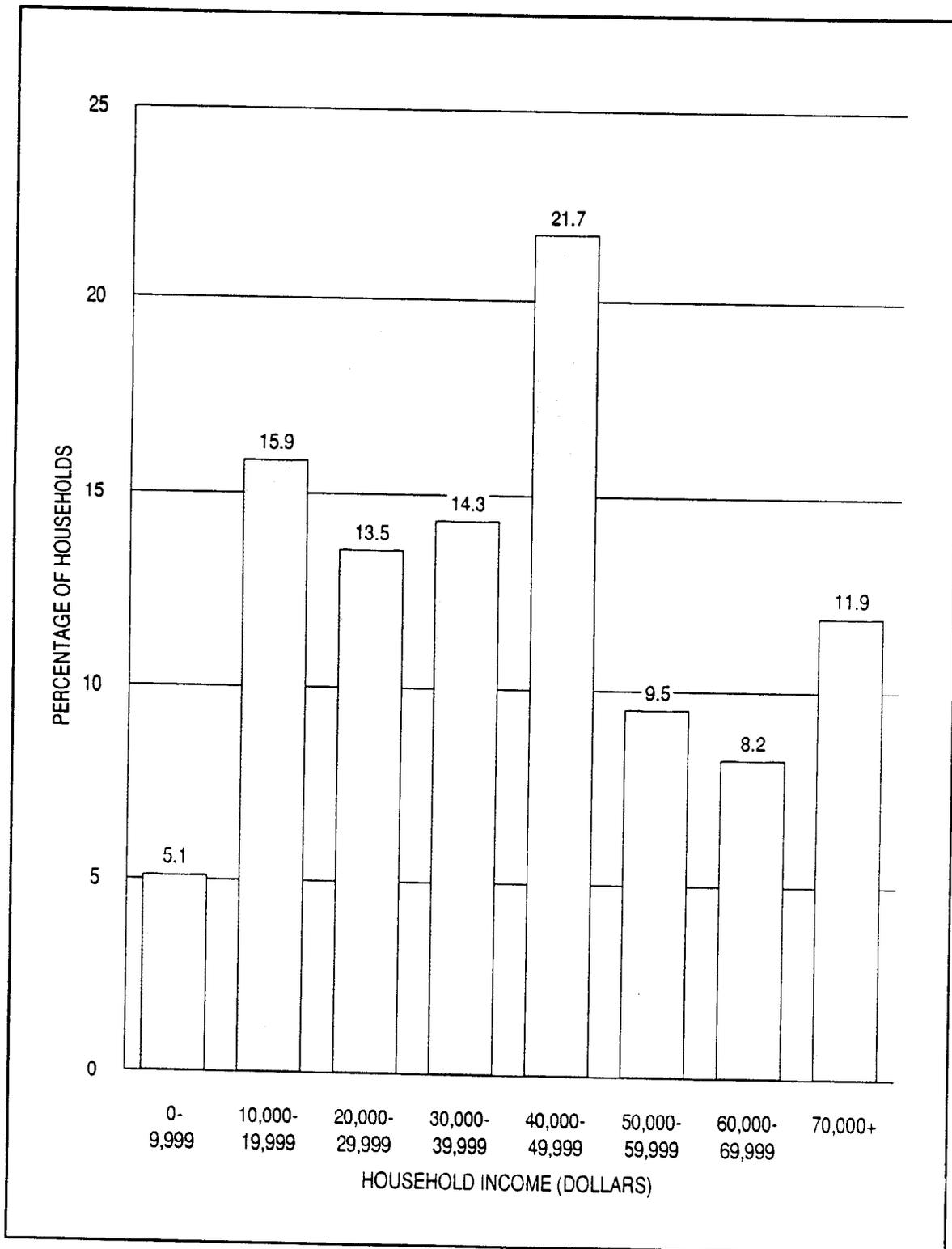


Fig. 14. Estimated total household income, Kotzebue, 1986.

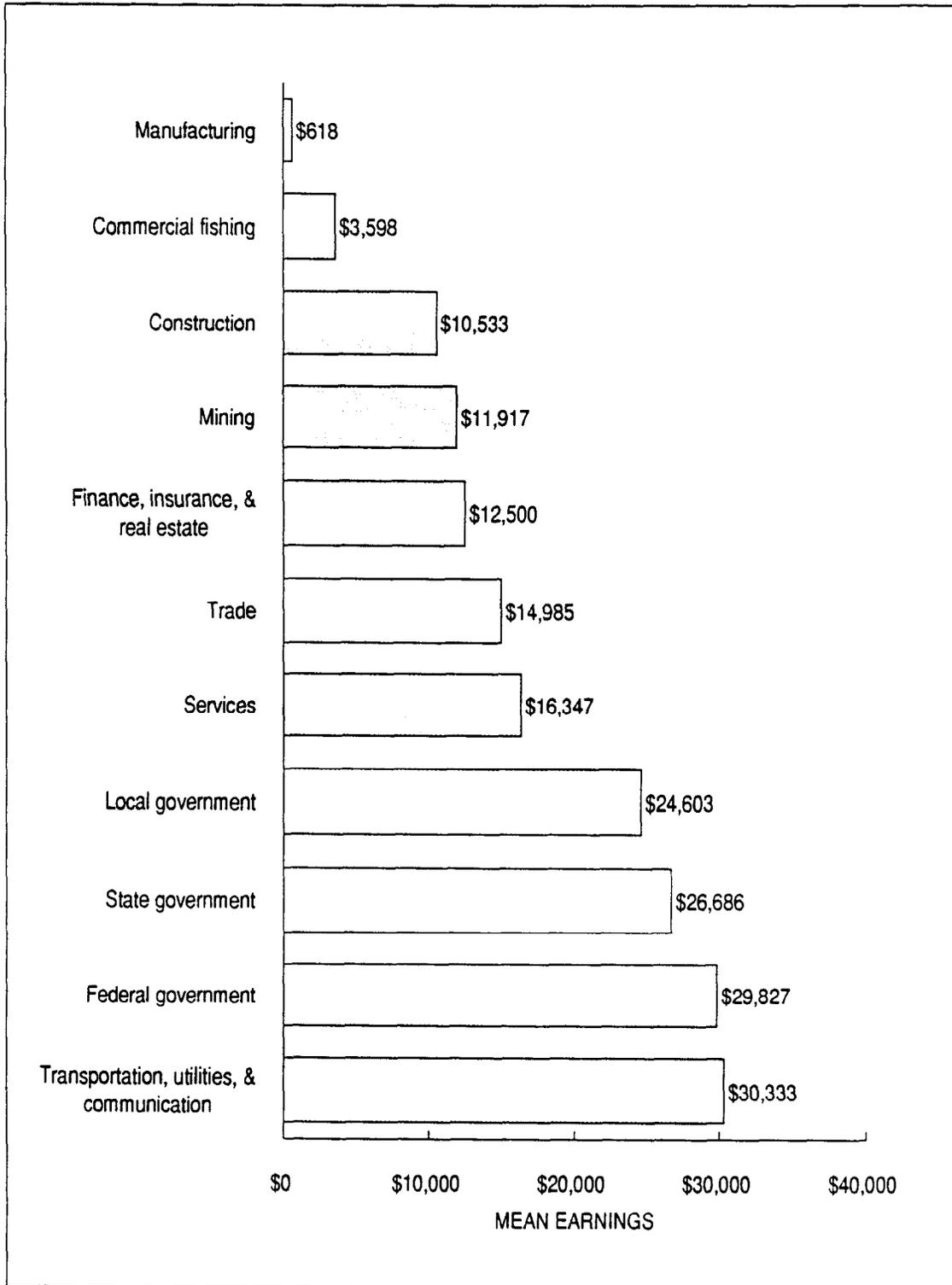


Fig. 15. Mean earnings per employed person by occupational category, Kotzebue, 1986.

difference in income between Kotzebue and the villages, a relationship still likely to be true (Fig. 16) (Alaska Department of Revenue 1988). Because an average of more than one tax return was filed per household, these income data cannot be directly compared to household income data collected in the 1986 Division of Subsistence survey.

COST OF LIVING

With all imported goods arriving by airplane or barge, the cost of living in Kotzebue was notably higher than in Anchorage. These higher costs affected nearly all aspects of life including food, fuel, utilities, housing, building supplies, dry goods, transportation, and services. Surveys by the University of Alaska Cooperative Extension Service showed that in September 1986 feeding a family of four with preschool children at home in Anchorage cost \$74.06 per week compared to \$117.05 per week in Kotzebue, an additional 58 percent. Gasoline was 76 percent more expensive in Kotzebue than in Anchorage, propane 142 percent more expensive, and heating oil 27 percent more expensive.

EQUIPMENT OWNERSHIP

Kotzebue residents owned a variety of equipment that enabled them to effectively hunt, fish, and preserve their catch. With a very limited local road system, Kotzebue hunters' and fishermen's foremost need was suitable transportation; a highway vehicle was almost useless in most resource harvest activities. Equipment considered largely recreational in other parts of the country -- in particular snowmachines and boats -- provided Kotzebue residents with this critical mobility. Other tools and accessories for resource harvesting were also essential, such as fish nets, rifles, sleds, drying racks, and freezers.

Equipment ownership correlated directly with household harvest level: in all equipment associated with hunting and fishing, high-harvest households owned more than medium-harvest

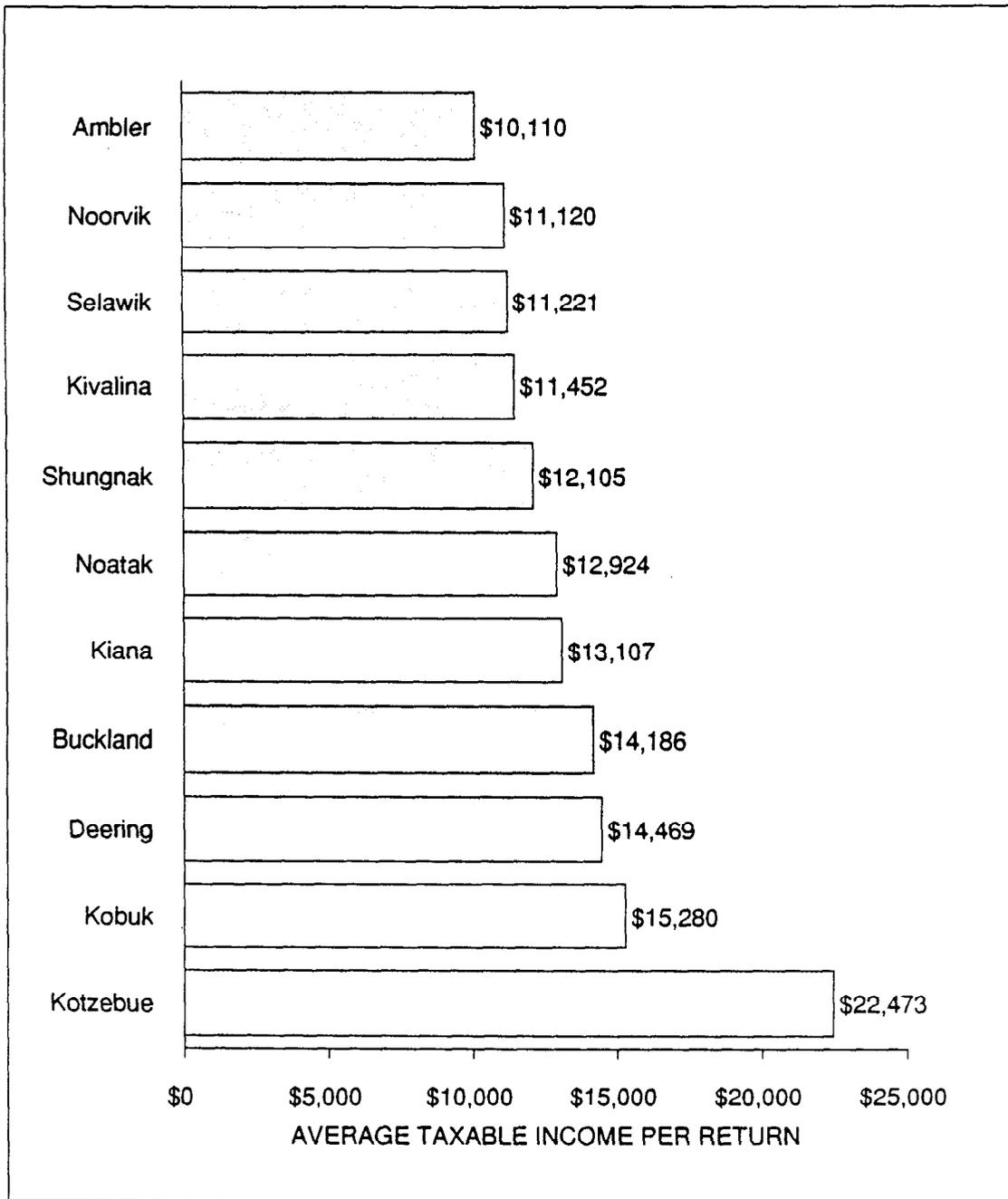


Fig. 16. Average taxable income per tax return. Kotzebue and surrounding communities, 1985.

households who owned more than low-harvest households (Table 8). Cars, trucks, all-terrain vehicles (ATVs), and airplanes were exceptions to this, but none of these were vital to resource harvesting in the Kotzebue area. Highway vehicles and ATVs (*i.e.*, three- and four-wheelers) were used primarily for transportation around town, while airplanes were used primarily for inter-village and inter-regional travel such as to Fairbanks or Anchorage.

For the community as a whole, ATVs, snowmachines, and freezers were each owned by more than one-half of Kotzebue households in 1986 (Table 8). Sleds, boats, outboard motors, and highway vehicles were each owned by more than one-third of the households. Although dogs were owned by 41.8 percent of households, only 14.8 percent of households had enough dogs (five or more) to constitute a dog team. Snowmachines were probably more prevalent than boats because they cost less and could be used for seven or eight months a year compared to the four- or five-month boating season.

One-half (50.1 percent) of the boats owned by Kotzebue residents were 22 to 24 feet in length with another 32.7 percent 16 to 21 feet in length. The remainder ranged from 9 to 17 feet and from 25 to 33 feet in length. Outboard motors in Kotzebue tended to be large; in 1986, 41.9 percent were 115 to 175 horsepower with another 21.4 percent 75 to 90 horsepower. The remainder ranged from 9 to 70 horsepower and from 185 to 235 horsepower. The single most common sized outboard motor was 140 horsepower.

In summary, the regional center of Kotzebue differed from the smaller, outlying communities in a number of respects including a larger, more diverse population; the availability of more goods and services; greater employment opportunities; and higher cash incomes. Kotzebue's overall employment pattern was not highly seasonal, in part due to the high percentage of government jobs in the community. Compared to Anchorage, the cost of living in Kotzebue was high. Kotzebue households were fairly well-equipped for harvest activities with more than one-half of households owning snowmachines, freezers, and all-terrain vehicles and more than one-third owning sleds, boats, and outboard motors.

TABLE 8. ESTIMATED EQUIPMENT OWNERSHIP, KOTZEBUE, 1986.

Equipment	Percentage of households owning	Estimated community total (number)	Mean number per household by harvest group			
			Low	Medium	High	All
Snowmachine	57.3	517	0.5	0.8	1.3	0.7
Sled	43.3	406	0.4	0.7	1.1	0.5
Traps	8.1	1,564	0	2.6	12.6	2.0
Dogs	14.8 ^a	1,889	1.3	3.7	7.2	2.5
Boat	37.2	307	0.3	0.5	0.9	0.4
Outboard motor	37.5	339	0.3	0.7	1.0	0.4
Fish net	26.3	522	0.3	1.2	2.0	0.7
Fish rack	19.2	273	0	0.9	1.3	0.4
Freezer	56.4	612	0.6	1.1	1.5	0.8
All-terrain vehicle	63.2	543	0.7	0.7	0.8	0.7
Highway vehicle	35.0	312	0.4	0.4	0.3	0.4
Airplane	4.4	42	0	0.1	0.1	0.1

Source: Division of Subsistence, ADF&G, household survey 1986. Characteristics for the entire community (N = 765 households with 2,681 people) were based on data obtained from 90 households in three sample groups. Data presented here were expanded in proportion to the sampling ratio.

(a) Only includes households with five or more dogs.

CHAPTER 4

CONTEMPORARY RESOURCE HARVEST AND USE

SEASONAL ROUND OF SUBSISTENCE ACTIVITIES

A seasonal round describes the hunting, fishing, and gathering cycle followed by a community each year. This seasonal sequence of activities evolves in response to a number of factors including the prevailing environmental conditions which affect travel and access to resources, the relative abundance of specific resources at certain times of the year, preferences for certain resources at certain times of the year, and regulatory constraints. While the particular details of a seasonal round vary with each community, the general pattern of a seasonal harvest cycle is followed in all communities that utilize wild foods.

The subsistence cycle in Kotzebue may be thought of as beginning each year at spring breakup when travel by snowmachine is no longer possible across the sea ice near Kotzebue. This usually occurs sometime in May, but may take place as late as June in some years. During breakup, surface travel to and from Kotzebue becomes difficult, if not impossible, because there is too little snow and ice for snowmachine travel, but too much for boating. To avoid this predicament, some Kotzebue residents move to spring hunting camps on the coast northwest of Kotzebue before the ice is unsafe for traveling. From these camps and from Kotzebue when enough open water permits boat travel, hunters go out in search of marine mammals, particularly the prized bearded seal but also ringed seal and, rarely, walrus. Migrating waterfowl are also hunted at this time and their eggs gathered as soon as they are available. Near town, dedicated fishermen continue to jig for sheefish on the remnants of shorefast ice. As the ice begins to clear, people fish for herring, small sheefish, whitefish, and Dolly Varden. Beluga hunting also begins at this time. A few people hunt muskrats on the Kobuk River delta. From a subsistence

perspective, this late spring and early summer season (late May-early July) is among the busiest of the year. With cool, dry weather and the availability of seals, much of the year's supply of seal oil and "black meat" (half-dried bearded seal) is produced at this time.

Summer comes to the northwest arctic coast in late June or July when ice-associated hunting diminishes and local boat travel is unrestricted by ice. Beluga hunting continues into July as does gathering of eggs and early greens. With the arrival of salmon in Kotzebue Sound in early July, many Kotzebue residents turn their attention to salmon fishing for both subsistence and commercial purposes. Berry picking commences in late July with the ripening of salmonberries, followed by blueberries, blackberries or crowberries, and cranberries. Dolly Varden begin to be incidentally caught in salmon nets in early August. Salmon fishing concludes around the end of August while berry picking continues through September.

Fall begins in Kotzebue when the salmon run has passed and cool weather coincides with the southward caribou migration to make hunting practical by boat before the rivers freeze. Fall ends when firm sea ice provides new travel routes and hunting areas. This season usually lasts from late August to early November.

In late August, Kotzebue residents begin hunting in earnest for moose and caribou along the Noatak and Kobuk River systems. This continues until the rivers begin to freeze up in late September. Waterfowl hunting and bear hunting also take place in September. A few Kotzebue residents hunt Dall sheep in the Baird and DeLong Mountains between mid-August and mid-September. As the rivers begin to freeze, Kotzebue residents catch their winter's supply of whitefish at the outlets of the lagoons near Cape Krusenstern. Roots are gathered along the Noatak River after the first frost. Cranberry picking continues. As ice begins to form in October, Kotzebue hunters pursue the young bearded seals and spotted seals that appear with the ice. As soon as ice forms on the lagoon or along the shore near town, residents jig for saffron cod, locally called "tomcod."

Winter sets in on the Kotzebue Sound coast in late October or November when surface travel by snowmachine becomes possible on the coastal ice. Caribou, if available, are hunted

throughout the winter as are moose, ptarmigan, and hare. Hunters travel widely in search of wolf, wolverine, and fox. Some residents set traps for fur animals. Ringed seals are hunted from offshore leads. In early winter, sheefish nets are set under the ice in "Kobuk Lake" (Hotham Inlet). As the daylight lengthens after the turn of the year, hunters travel farther in search of moose, caribou, fur animals, and seals. Sheep hunting takes place in the Baird Mountains in late winter and early spring. Bears are taken as they emerge from their dens. Jigging for sheefish begins with intensity in March and continues until the ice is no longer safe for traveling. Small numbers of burbot and northern pike are caught along with the sheefish.

Winter ends in April when mild temperatures, long days, and softening snow herald the coming of breakup. Sheep and bear hunting and sheefish fishing continue throughout this month as long as traveling conditions are good. Ringed seal hunting also picks up. The first waterfowl of the year are taken in late April or early May. Some Kotzebue residents travel to Kivalina and Point Hope in April to join bowhead whaling crews. Others move to spring camps in the *Sisualik* (Sheshalik on U.S.G.S. maps) and Cape Krusenstern areas.

This seasonal pattern varies annually according to weather, temperature, traveling conditions, and species availability. Longer term changes in the seasonal round also occur as a result of expanding or diminishing fish and wildlife populations, changes in technology, geographical shifts in human settlement and land use, and regulatory changes. The seasonal round presented for Kotzebue in Figure 17 reflects the harvest activities most commonly engaged in by Kotzebue residents in the Kotzebue vicinity. Because Kotzebue's population is diverse, some Kotzebue residents participate in harvest activities in other communities, such as beluga hunting in Buckland, Dolly Varden seining in Noatak, burbot fishing in Kiana, or bowhead whaling in Kivalina. These activities are not reflected in Figure 17.

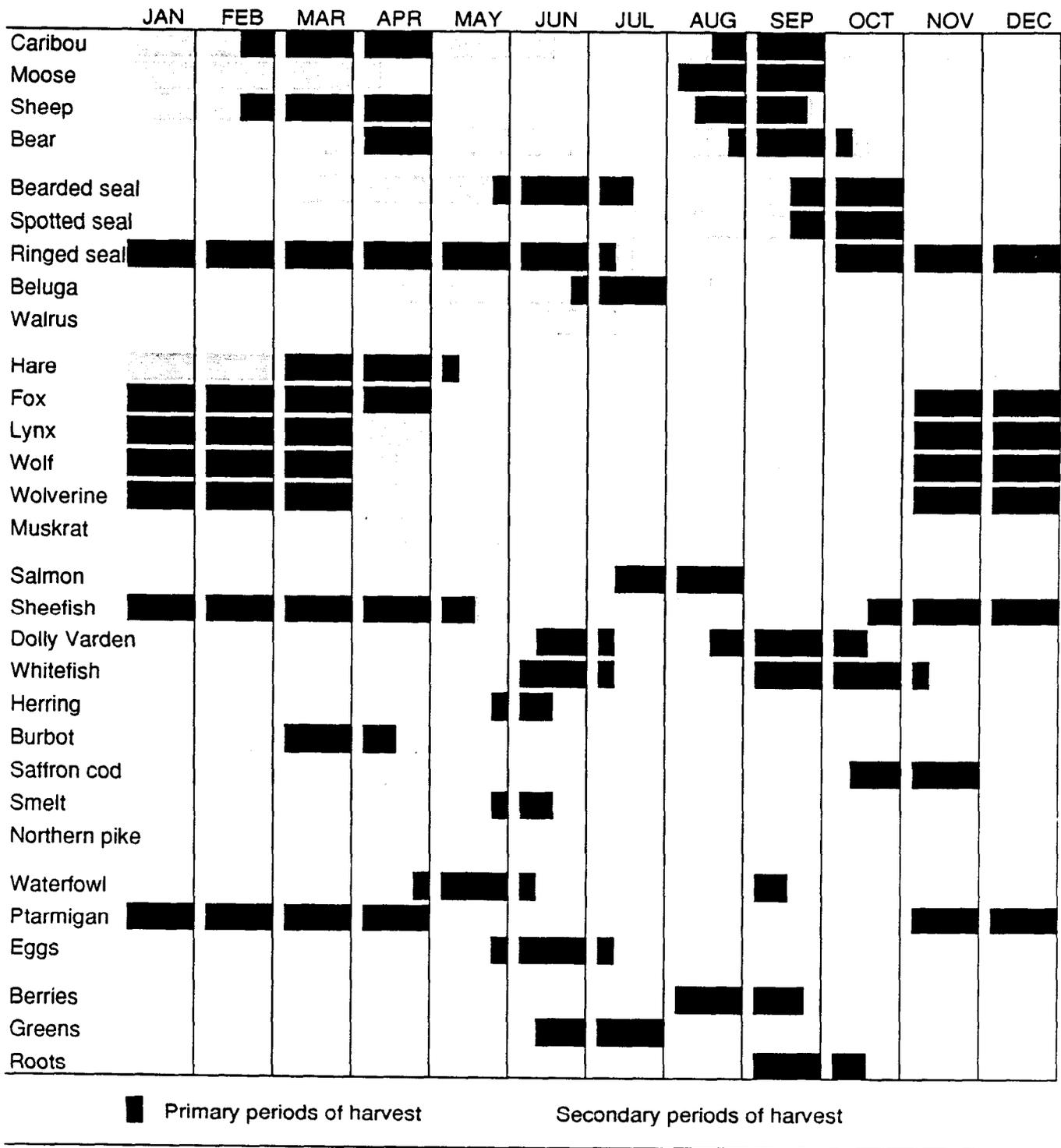


Fig. 17. Seasonal round of major subsistence activities in Kotzebue, ca. 1986.

HOUSEHOLD PARTICIPATION IN RESOURCE HARVEST ACTIVITIES

Participating effectively in harvest activities in the Kotzebue area required time, equipment, and, in most cases, a great deal of knowledge. Not only did a Kotzebue hunter or fisherman need to know where and when to find certain resources, but he or she also needed to know how to pilot a boat, drive a snowmachine, repair an engine, not get lost, and respond appropriately to adverse weather, water, and other environmental conditions. Few harvest activities took place in areas that could be reached by road.

Not surprisingly, then, berry picking -- which required virtually no equipment and could take place within walking distance of town -- was the harvest activity in which the most households (56.6 percent) participated. This was also the only specific resource harvest activity in which more than one-half of all Kotzebue households successfully participated. Harvest activities in which one-third to one-half of Kotzebue households successfully participated included caribou and duck hunting and salmon, sheefish, and Dolly Varden fishing (Table 9).

In nearly all specific resource harvest activities, Alaska Native households participated to a greater extent than non-Native households (Table 10). This was especially true with marine mammals, waterfowl, ptarmigan, caribou, saffron cod, smelt, herring, and greens. Of the 44 harvest activities listed in Table 10, Native households successfully participated in 43 of them (97.7 percent) while non-Native households successfully participated in 25 (56.8 percent). In general, Native households were more knowledgeable about harvest activities, more tied to harvest activities as an expression of their lives and culture, and more likely to have food preferences encompassing a wider variety of wild resources than non-Native households. With some resources, regulatory constraints on rural, non-Native hunters were greater than on Native hunters. For example, the 1972 Marine Mammal Protection Act allowed only Alaska Natives to hunt marine mammals. Similarly, only Alaska Natives were allowed to harvest some seabird species, including murre, puffins, and guillemots.

TABLE 9. ESTIMATED QUANTITIES OF RESOURCES HARVESTED, HOUSEHOLD PARTICIPATION RATES, AND SHARING OF WILD RESOURCES, KOTZEBUE, 1986.

Resource	Percentage of households which				Average per		Total harvested (number)	Total harvested (pounds)	95 percent confidence interval (+/-)	
	Attempted harvest	Harvested	Used	Gave	Received	household capita harvest (pounds)				household harvest (pounds)
Big game	50.8	48.6	88.1	47.7	66.8	111.8	391.8	2,029	299,709	23
Caribou	49.7	45.2	88.1	40.3	57.9	97.2	340.7	1,917	260,645	26
Moose	26.7	8.4	42.0	6.7	34.0	13.0	45.4	65	34,721	41
Dall sheep	5.7	1.5	5.5	1.1	4.0	0.7	2.4	18	1,820	107
Brown bear	4.8	2.2	5.2	2.2	2.9	0.3	1.0	9	740	199
Black bear	8.0	2.6	2.6	2.6	0.4	0.7	2.3	20	1,783	171
Marine mammals	23.1	18.3	64.3	23.6	60.2	109.3	383.2	1,230	293,114	65
Bearded seal	19.6	14.8	47.2	14.3	34.2	69.3	243.0	443	185,871	68
Juv. bearded seal	10.3	7.0	8.1	3.7	1.9	6.2	21.6	94	16,556	78
Ringed seal	9.9	9.9	17.3	4.8	7.4	12.2	42.6	440	32,580	79
Spotted seal	7.4	6.2	8.5	3.0	3.0	7.4	25.8	201	19,737	107
Ribbon seal	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0	0	-
Beluga	13.0	2.6	19.2	4.7	16.6	7.4	26.4	20	20,165	170
Walrus	5.2	0.8	5.4	2.2	4.6	4.4	15.4	15	11,807	119
Polar bear	2.9	2.2	7.8	2.2	5.6	2.4	8.4	17	6,398	198
Bowhead whale	5.6	0.7	41.1	7.8	41.1	a	a	a	a	-
Small game & furbearers	20.5	17.2	45.0	9.8	31.8	1.4	4.8	1,993	3,642	101
Porcupine	1.9	1.5	1.5	0.0	0.0	<0.1	0.1	11	91	105
Beaver	3.1	0.8	10.3	0.4	9.5	<0.1	0.3	12	245	131
Snowshoe hare	4.3	0.8	0.8	0.4	0.0	<0.1	0.1	34	84	152
Arctic hare	7.7	1.9	2.6	0.8	0.7	0.1	0.5	64	400	96
Arctic fox	5.3	0.4	1.1	0.0	0.7	b	b	6	b	-
Red fox	15.3	11.3	17.2	4.9	5.9	b	b	178	b	-
Lynx	2.5	0.4	0.4	0.0	0.0	0.0	0.0	3	0	-
Muskkrat	6.7	6.3	7.8	4.1	1.5	1.1	3.7	1,568	2,822	125
Marten	1.1	0.4	1.1	0.0	0.7	b	b	43	b	-

TABLE 9. -- CONTINUED

Resource	Percentage of households which				Average per		Total harvested (pounds)	Total harvested (number)	95 percent confidence interval (+/-)
	Attempted harvest		Gave		capita harvest (pounds)	household harvest (pounds)			
	Harvested	Used	Received	Received	harvest (pounds)	harvest (pounds)			
Mink	2.1	0.0	0.0	0.0	0.0	0.0	0	-	
Land otter	3.3	1.6	0.0	0.8	b	b	6	b	
Ground squirrel	0.7	0.0	0.0	0.0	0.0	0.0	0	-	
Weasel	3.7	3.1	2.2	0.0	b	b	26	b	
Wolf	9.5	13.5	0.0	10.6	b	b	22	b	
Wolverine	8.8	12.2	2.2	9.5	b	b	20	b	
Birds and eggs									
Ducks	51.1	64.0	26.6	30.6	6.5	22.6	15,938	17,300	
Geese	38.2	49.6	18.8	13.9	2.6	9.1	4,626	6,939	
Ptarmigan	35.3	42.3	11.5	12.8	2.5	8.9	1,617	6,790	
Grouse	34.0	41.0	13.3	16.1	0.8	2.8	3,053	2,137	
Crane	1.9	1.9	1.1	0.0	<0.1	<0.1	43	30	
Snowy owl	2.2	1.5	0.0	0.0	<0.1	0.2	17	139	
Eggs	0.7	0.7	0.0	0.0	<0.1	<0.1	5	15	
	8.2	15.9	6.7	7.8	0.5	1.6	6,577	1,250	
Fish									
Salmon	75.1	95.1	59.5	79.9	161.4	565.7	239,624	432,774	
Sheefish	51.3	85.4	29.9	43.9	73.1	256.2	32,128	195,981	
Dolly Varden	44.8	76.0	33.4	50.2	48.7	170.7	23,742	130,580	
Saffron cod	38.3	59.0	16.3	29.3	9.2	32.4	7,503	24,759	
Whitefish	31.5	42.9	22.3	12.6	5.3	18.5	67,233	14,119	
Northern pike	21.0	55.0	8.9	38.5	6.3	21.9	9,594	16,789	
Herring	30.7	42.5	11.6	16.7	7.1	24.8	5,750	18,976	
Grayling	29.6	33.3	14.0	4.9	3.7	12.8	54,365	9,786	
Burbot	25.0	31.3	4.7	6.3	0.7	2.6	2,191	1,972	
Smelt	23.7	34.1	5.9	14.5	1.2	4.1	739	3,105	
Flounder	17.5	24.3	4.7	6.8	0.9	3.1	16,885	2,364	
Sculpin	7.3	9.5	1.1	2.2	4.4	15.4	10,678	11,746	
Sucker	4.2	4.2	1.1	0.0	0.5	1.8	6,678	1,402	
	1.9	1.9	0.0	0.0	0.3	1.1	615	861	

TABLE 9. -- CONTINUED

Resource	Percentage of households which				Average per		Total harvested (number)	Total harvested (pounds)	95 percent confidence interval (+/-)
	Attempted harvest	Harvested	Used	Gave	Received	capita harvest (pounds)			
Blackfish	0.4	0.4	0.4	0.0	0.0	<0.1	<0.1	19	168
Stickleback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	-
Clams	1.8	1.8	6.3	0.7	4.5	<0.1	0.2	1,170	124
Crab	1.5	1.5	10.0	0.8	8.6	<0.1	0.2	77	115
Berries and plants	57.7	57.7	81.2	24.5	40.8	7.7	27.1	c	27
Berries	56.6	56.6	81.2	20.5	39.6	7.1	25.0	c	28
Greens	16.1	16.1	18.4	8.3	3.1	0.6	2.1	c	68
Roots	0.4	0.4	4.3	0.0	3.9	<0.1	<0.1	c	166
All resources	78.4	78.4	100.0	71.6	96.3	398.1	1,395.1	c	1,067,280

Source: Division of Subsistence, ADF&G, household survey 1986. Harvest estimates for the entire community (765 households) were based on data obtained from 90 households in three sample groups. Data presented here were expanded in proportion to the sampling ratio. See the methodology section of the text for a detailed description of the sampling procedure.

(a) Although one sampled household was a member of a successful Point Hope whaling crew, the whale was not included in Kotzebue's harvest because the household received only a small portion of the animal.

(b) Pounds not included because these animals were not eaten.

(c) Number harvested not applicable.

TABLE 10. ALASKA NATIVE AND NON-NATIVE PARTICIPATION IN HARVEST ACTIVITIES OF SELECTED RESOURCES, KOTZEBUE, 1986.

Resource	Participation		
	Percentage of total households	Percentage of Alaska Native households	Percentage of non-Native households
Berries	56.6	60.1	50.9
Salmon	49.0	52.0	44.3
Caribou	45.2	52.0	34.3
Sheefish	42.5	47.6	34.3
Ducks	37.8	45.0	26.3
Dolly Varden	33.4	32.9	34.3
Ptarmigan	31.8	38.6	20.9
Geese	31.0	38.6	18.7
Saffron cod	30.8	44.9	8.0
Northern pike	30.3	21.8	44.0
Pacific herring	29.2	38.6	13.8
Arctic grayling	25.0	21.0	31.5
Burbot	23.0	26.3	17.6
Whitefish species	21.0	20.7	21.5
Rainbow smelt	17.5	27.7	1.0
Greens	16.1	24.8	2.1
Bearded seal	14.8	23.9	0.0
Red fox	11.3	10.4	12.8
Ringed seal	9.9	16.1	0.0
Moose	8.4	13.6	0.0
Eggs	8.2	13.3	0.0
Flounder	7.3	7.5	6.9
Muskrat	6.3	10.2	0.0
Spotted seal	6.2	9.4	1.0
Sculpin	4.2	6.8	0.0
Wolf	2.9	1.1	5.9
Wolverine	2.9	0.6	5.9
Beluga	2.6	4.3	0.0
Black bear	2.6	0.6	5.9
Polar bear	2.2	4.7	0.0
Brown bear	2.2	0.0	5.9
Spruce grouse	1.9	3.1	0.0
Arctic hare	1.9	3.1	0.0
Longnose sucker	1.9	2.4	1.0
Crab	1.5	2.4	0.0
Sandhill crane	1.5	2.4	0.0
Dall sheep	1.5	2.4	0.0
Porcupine	1.5	2.4	0.0
Walrus	0.8	1.3	0.0
Beaver	0.8	0.6	1.0
Snowshoe hare	0.8	1.3	0.0
Snowy owl	0.7	1.1	0.0
Alaska blackfish	0.4	0.6	0.0
Roots	0.4	0.6	0.0

Source: Division of Subsistence, ADF&G, household survey 1986. Harvest participation reported by sampled households was expanded on a household basis to estimate total community participation.

In aggregated resource categories such as fish or big game, Kotzebue households showed higher levels of participation than in the specific resource harvest activities. Three-quarters (75.1 percent) of all Kotzebue households harvested fish while almost one-half (48.6 percent) harvested big game and 51.1 percent harvested birds or eggs (Fig. 18). Of all Kotzebue households, 78.4 percent harvested resources from at least one resource category during the study year (Table 9).

Use of resources was even greater than harvest participation; for example, 95.1 percent of households used fish, 88.1 percent used big game, and 64.3 percent used marine mammals (Table 9). The most widely used specific resources included caribou (88.1 percent of households), salmon (85.4 percent), berries (81.2 percent), and sheefish (76.0 percent). All sampled households (for an expanded estimate of 100 percent of Kotzebue households) used some type of wild food during the study year (Table 9).

OVERVIEW OF HARVEST

Perhaps the most unusual feature of Kotzebue's harvest of wild foods was that three very different resource categories -- fish, marine mammals, and big game -- comprised similarly large portions of the total pounds of resources harvested (Fig. 19). This contrasted with many other communities in rural Alaska where one resource category typically accounted for half or more of the community's total harvest. For example, in Barrow, marine mammals accounted for 56 percent of the community harvest (1988); in Fort Yukon, fish accounted for 73.0 percent of the harvest (1987); in Galena, fish accounted for 77.1 percent of the harvest (1985); and in Dillingham, fish accounted for 65.6 percent of the harvest (1984) (Braund and Associates 1989:16; Alaska Department of Fish and Game 1992). With its diverse resource base, Kotzebue was particularly well situated to weather temporary species-specific shifts in resource abundance and availability.

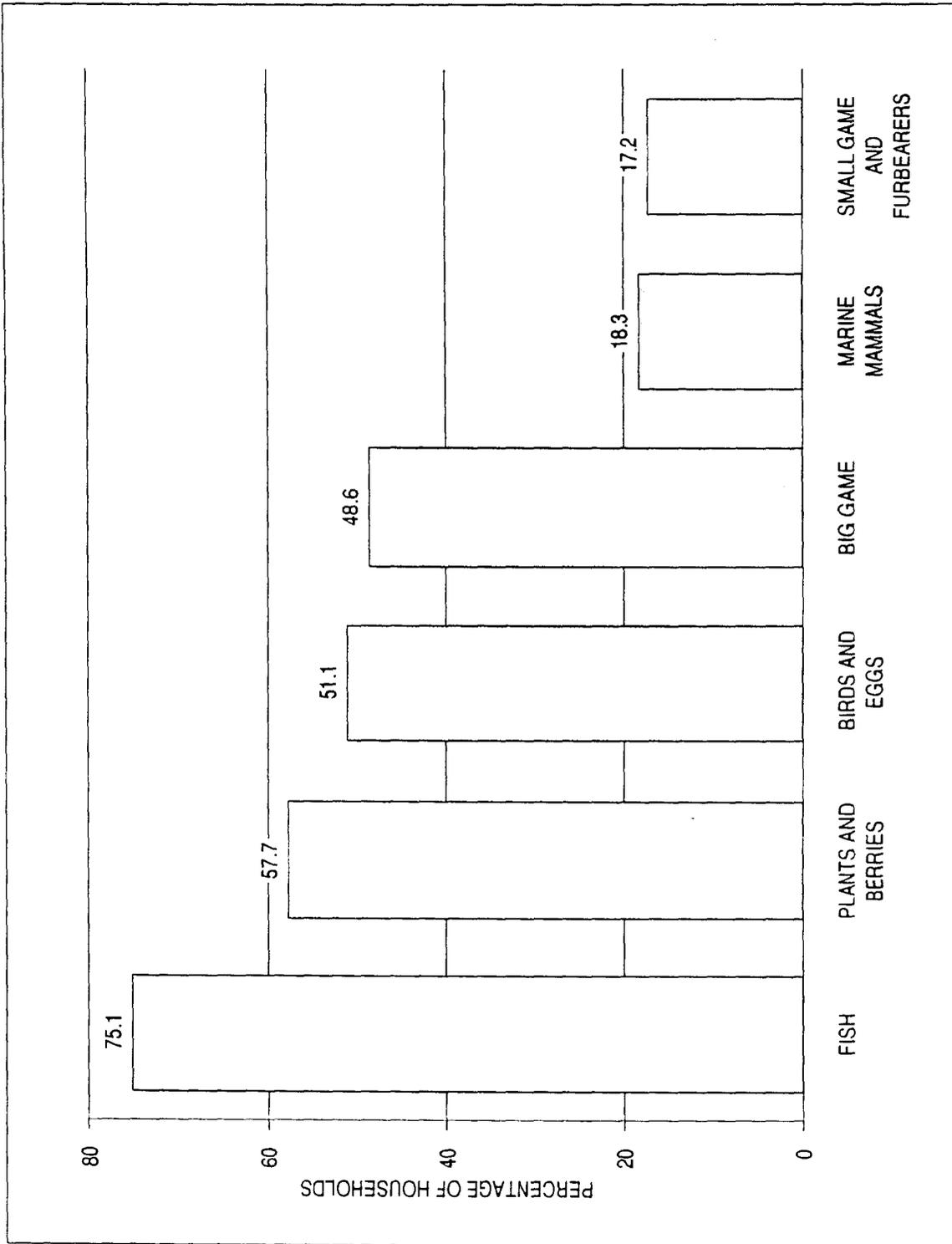


Fig. 18. Percentage of households harvesting from each of six resource categories, Kotzebue, 1986.

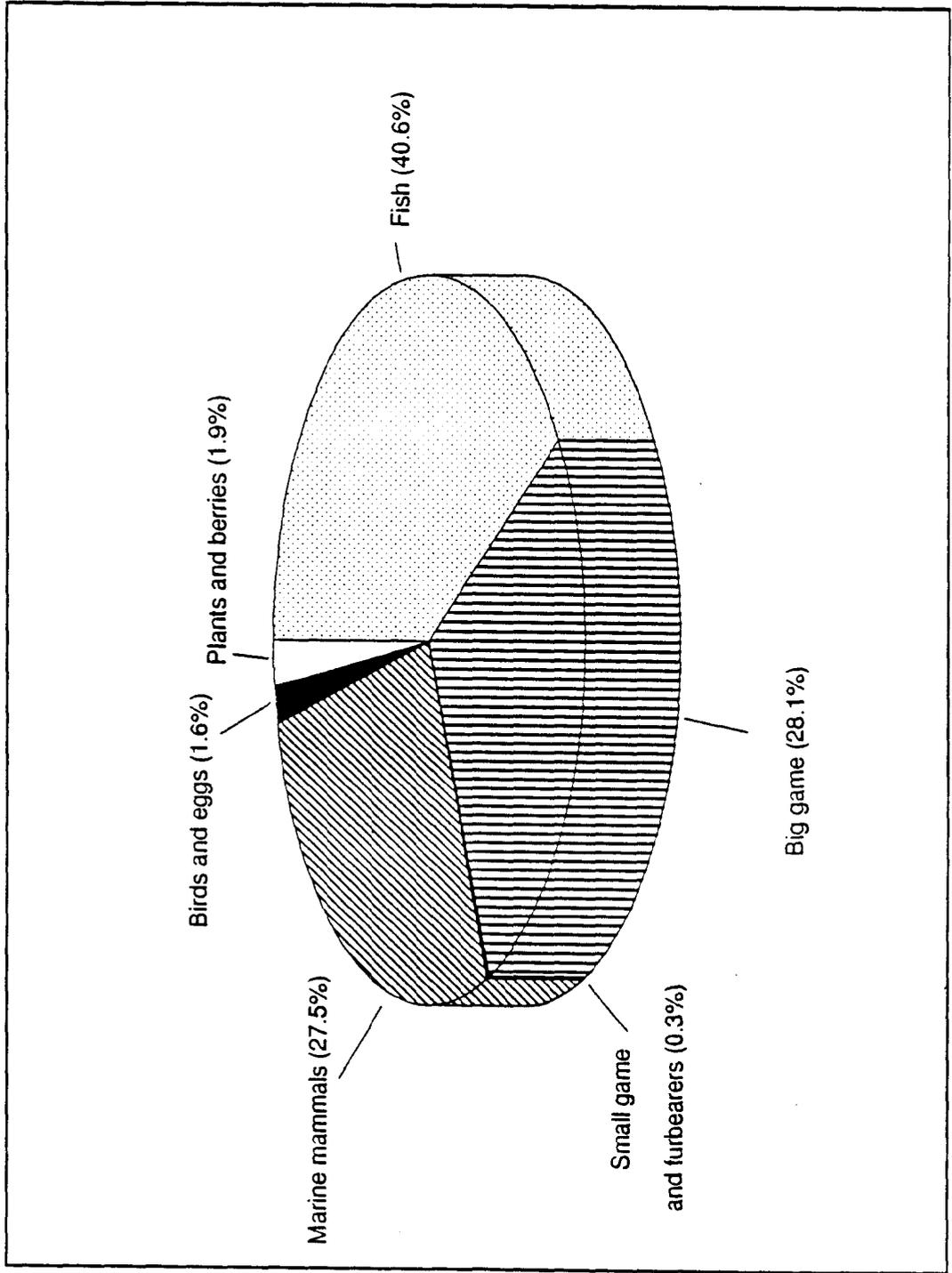


Fig. 19. Proportion of the total pounds edible weight contributed by each resource category, Kotzebue, 1986.

In Kotzebue, four specific resources accounted for 74.0 percent of the community harvest in 1986: caribou (24.4 percent), bearded seal (19.0 percent), salmon (18.4 percent), and sheefish (12.2 percent) (Fig. 20). Moose, ringed seal, and Dolly Varden contributed 3.2 percent, 3.0 percent, and 2.3 percent respectively to Kotzebue's total harvest with the remaining resources each accounting for 2.0 percent or less of the harvest (Table 11).

An estimated total of 1,067,278 pounds of edible wild resources were harvested by Kotzebue households in 1986. This was the equivalent of 1,395.2 pounds per household or 398.1 pounds per capita (Table 9). For comparison, Barrow's per capita harvest was 217.1 pounds (1987); Dillingham's was 242.2 pounds (1984); and Fort Yukon's was 998.8 pounds (1987) (Braund and Associates 1989:14; Alaska Department of Fish and Game 1992).

As in harvest participation, substantial differences in harvest quantities existed between Native and non-Native households. In Native households, for example, the mean per capita harvest of fish, birds, and berries was almost three times greater than that in non-Native households, the mean per capita big game harvest five times greater, and the mean per capita marine mammal harvest 200 times greater (Fig. 21). Overall, Native households harvested a per capita average of 518.1 pounds of edible wild resources during the study year, more than four times the average non-Native per capita harvest of 112.2 pounds (Fig. 22).

Substantial differences in harvest quantities also existed among individual Kotzebue households (Fig. 23). An estimated 29.4 percent of households harvested 1-299 pounds of wild food, while at the other end an estimated 10.4 percent harvested 4,000 or more pounds of wild food. Of the sampled households, harvests ranged from 0 to 21,298 pounds.

Use of Wild Resources for Dog Food

Expanded survey results showed that 41.8 percent of Kotzebue households owned one or more dogs in 1986 with 14.8 percent of households owning five or more. The estimated dog population in Kotzebue during the study year was 1,889 dogs. Of dog-owning households, an

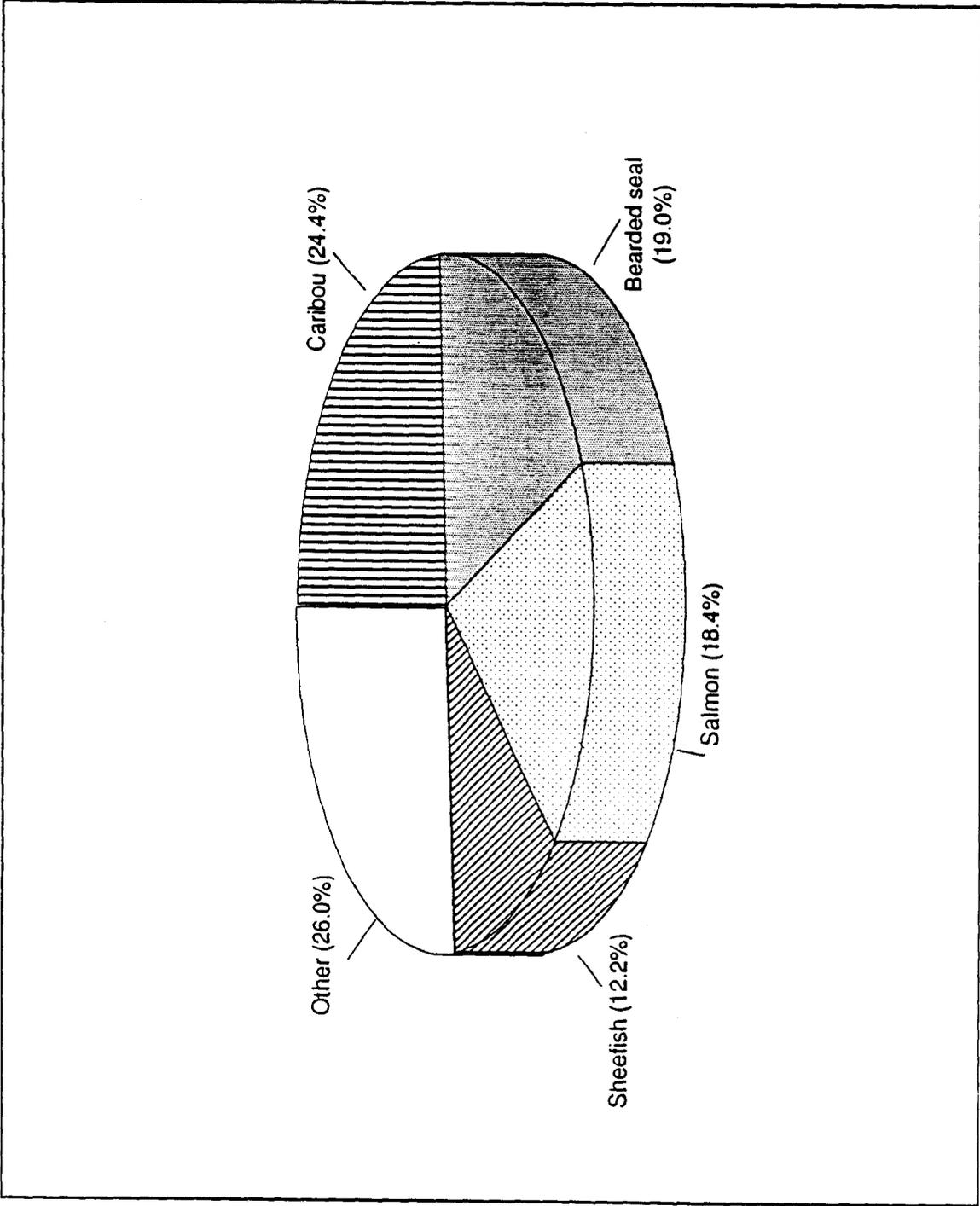


Fig. 20. Proportion of the total pounds edible weight contributed by four major resources, Kotzebue, 1986.

TABLE 11. CONTRIBUTION OF RESOURCE CATEGORIES TO TOTAL COMMUNITY HARVEST, KOTZEBUE, 1986.

Resource category	Percentage of contribution within category	Percentage of contribution to overall harvest
Big Game		28.1
Caribou	87.0	24.4
Moose	11.6	3.2
Dall sheep	0.6	0.2
Black bear	0.6	0.2
Brown bear	0.2	a
Marine Mammals		27.5
Bearded seal	69.1	19.0
Ringed seal	11.1	3.0
Spotted seal	6.7	1.8
Beluga	6.9	1.9
Walrus	4.0	1.1
Polar bear	2.2	0.6
Small Game and Furbearers		0.3
Beaver	6.7	a
Muskrat	77.5	0.3
Arctic hare	11.0	a
Snowshoe hare	2.3	a
Porcupine	2.5	a
Birds and Eggs		1.6
Ducks	40.1	0.7
Geese	39.2	0.6
Ptarmigan	12.4	0.2
Eggs	7.2	0.1
Other birds	1.1	a
Fish		40.6
Salmon	45.3	18.4
Sheefish	30.2	12.2
Dolly Varden	5.7	2.3
Saffron cod	3.3	1.3
Whitefish	3.9	1.6
Northern pike	4.4	1.8
Flounder	2.7	1.1
Pacific herring	2.3	0.9
Rainbow smelt	0.5	0.2
Arctic grayling	0.4	0.2
Burbot	0.7	0.3
Sculpin	0.3	0.1
Other fish and shellfish	0.3	0.1
Berries and Plants		1.9
Berries	92.3	1.8
Greens	7.6	0.1
Roots	0.1	a

Source: Division of Subsistence, ADF&G, household survey 1986.

(a) Less than 0.1 percent.

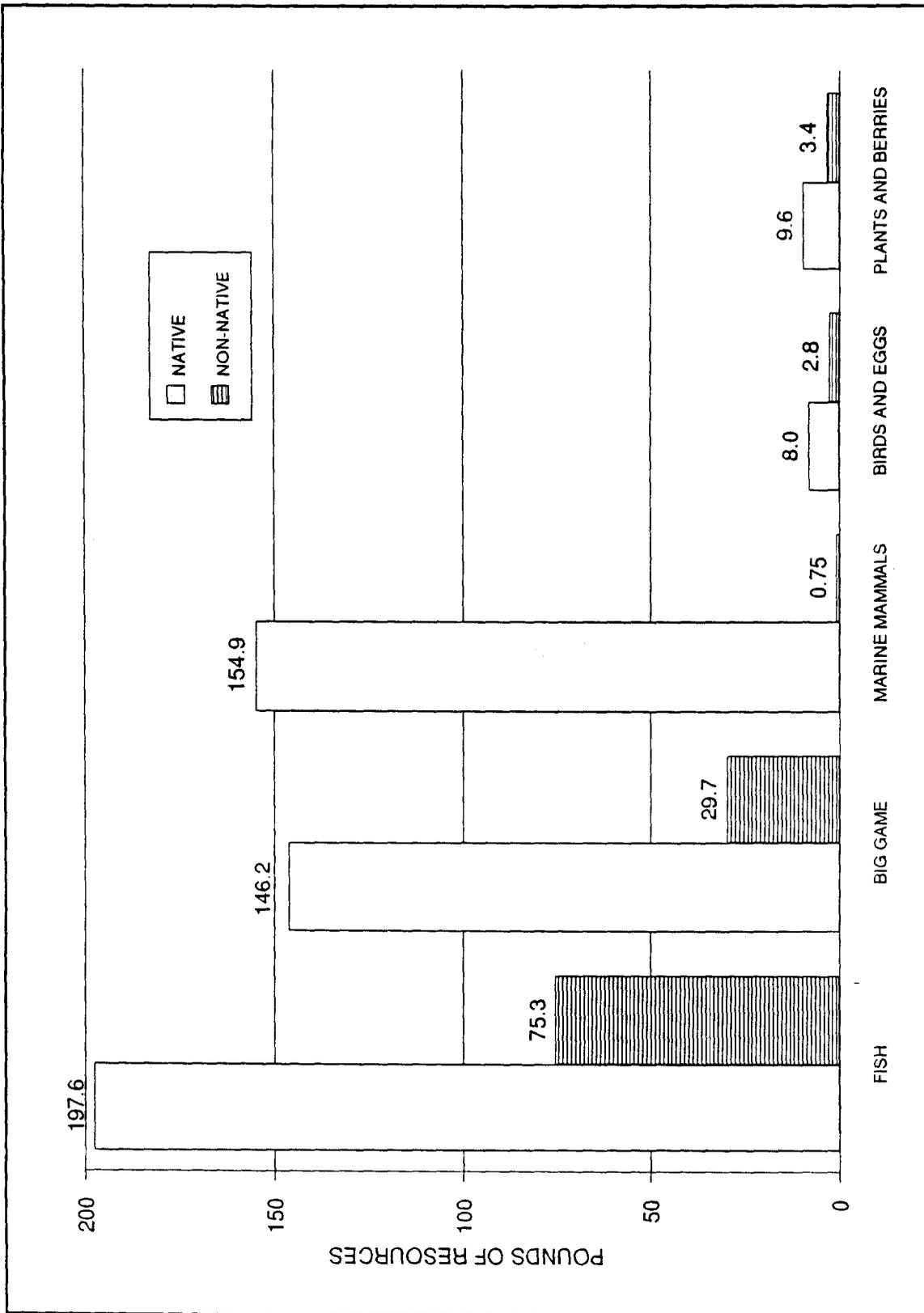


Fig. 21. Mean per capita harvest of five resource categories by Native and non-Native households, Kotzebue, 1986.

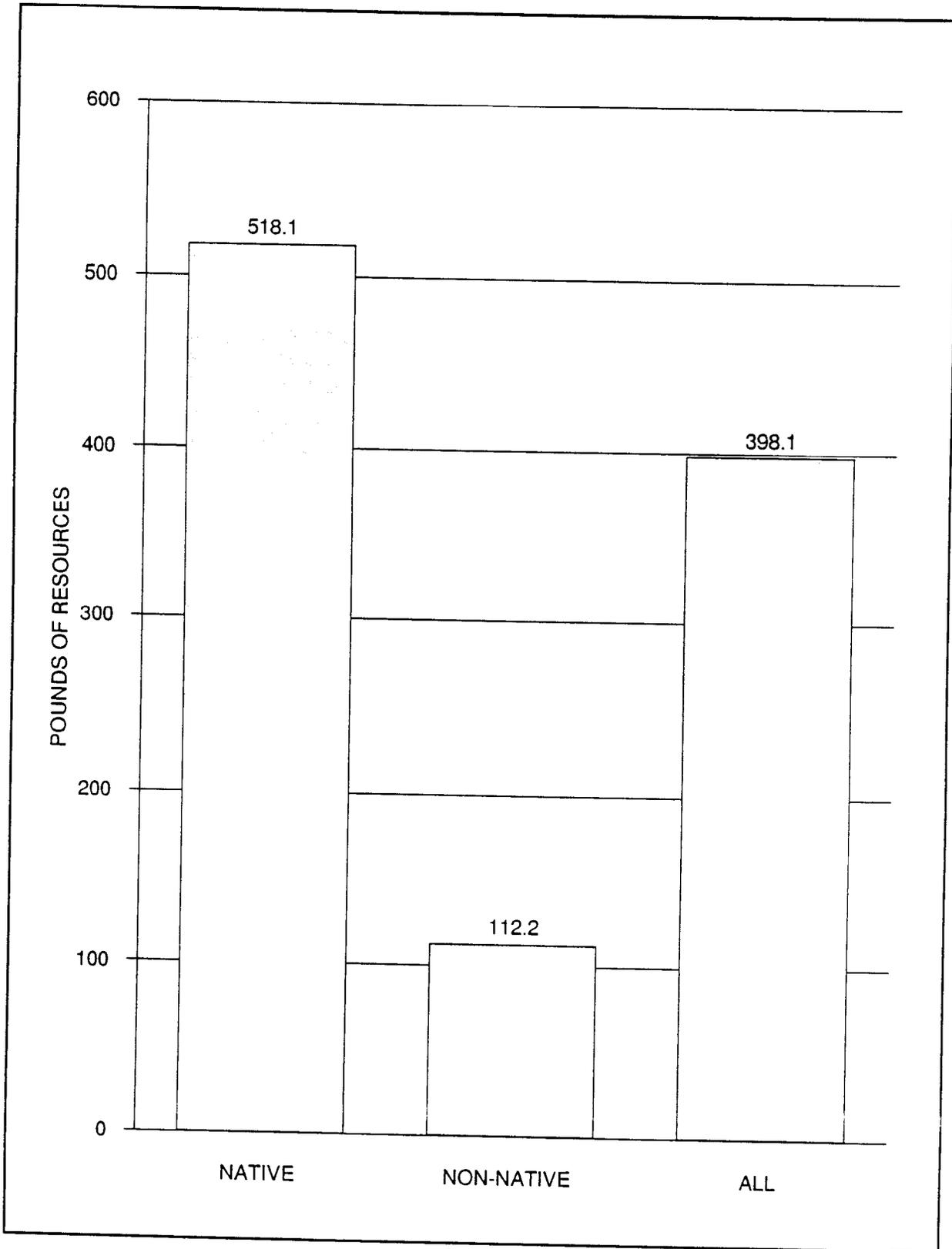


Fig. 22. Total mean per capita harvest of wild resources by Native, non-Native, and all households, Kotzebue, 1986.

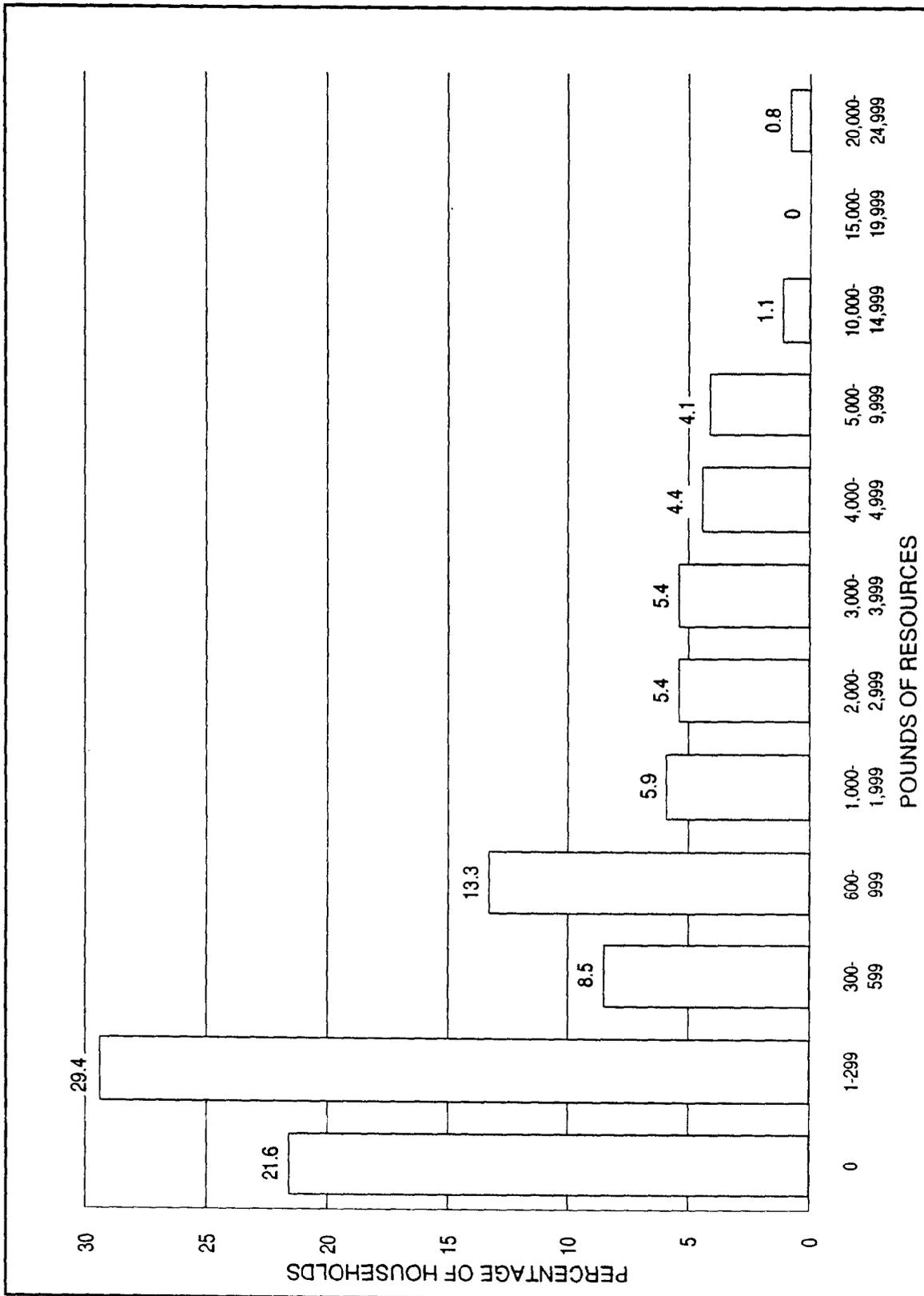


Fig. 23. Pounds of wild resources harvested by Kotzebue households, 1986.

estimated 44.5 percent supplemented commercial dog food with wild resources, particularly fish, while another 25.0 percent fed their dogs wild food scraps, but did not harvest resources specifically for dog food. About 30.5 percent of dog-owning households reported using only commercial dog food.

An estimated 74,127 pounds of wild resources were used for dog food in Kotzebue in 1986, or about 6.9 percent of Kotzebue's total wild food harvest. This was the equivalent of about 97 pounds per household, 39 pounds per dog per year, or about 1/10 of a pound per dog per day. Sheefish accounted for almost one-half (49.7 percent) of the wild resources used for dog food, or an estimated 6,695 fish; this comprised 28.2 percent of Kotzebue's total sheefish harvest (Table 12). Salmon accounted for 26.2 percent of the resources used for dog food, or an estimated 3,190 fish (about 9.9 percent of Kotzebue's total subsistence salmon harvest). Whitefish and herring accounted for 4.7 and 3.4 percent respectively of the resources used for dog food, while other resources including saffron cod, flounder, northern pike, muskrat, caribou, and seal accounted for 16.0 percent of the resources used for dog food. About one-fifth of Kotzebue's total whitefish harvest and about one-fourth of its herring harvest were used for dog food.

Several dog feeding practices were common in Kotzebue. Households with one or two dogs frequently fed their animals old, suspicious-looking, or less palatable parts of wild foods as well as table scraps and processing by-products (such as fish heads and entrails, blood-shot meat, etc.). Many dog mushers did the same and also obtained wild foods specifically for dog food. Supplementing expensive commercial dog food with a variety of wild foods helped defray the expense of owning a dog team. When households without dogs seasonally cleaned out their freezers, they frequently offered dog mushers old wild foods that would otherwise be discarded. Some wild foods, such as birds, bear meat, and sculpins (unless the spiny heads were removed), were generally considered unsuitable for dogs while others, such as herring, whitefish, sheefish, and salmon, were generally regarded as good sources of dog food. State regulations in 1986

TABLE 12. ESTIMATED USE OF WILD RESOURCES FOR DOG FOOD, KOTZEBUE, 1986.

Resource	Pounds used	Percentage of total resources used for dog food	Number of fish	Percentage of total community harvest of resource
Sheefish	36,823	49.7	6,695	28.2
Salmon	19,460	26.2	3,190	9.9
Whitefish	3,470	4.7	1,983	20.7
Herring	2,536	3.4	14,089	25.9
Other ^a	11,838	16.0	NA	NA
Total	74,127	100.0		

Source: Division of Subsistence, ADF&G, household survey 1986. Resource use for dog food reported by sampled households was expanded on a household basis to estimate totals for the community (N = 765 households with 2,681 people).

Note: Kotzebue had an estimated dog population of 1,889 in 1986.

(a) "Other" includes saffron cod, flounder, northern pike, muskrat, caribou, and seal.

prohibited the feeding of most kinds of big game meat to dogs, but some households nevertheless used caribou to supplement their dogs' diets.

BIG GAME HUNTING

The big game species available to Kotzebue hunters in the 1980s were caribou, moose, Dall sheep, black bear, and brown bear. Of these, caribou was overwhelmingly the major subsistence resource in Kotzebue; 87.0 percent of the edible big game harvest by Kotzebue residents in 1986 was caribou (Table 11). Other species, however, added variety to the diet and provided alternative or supplementary food sources when caribou were not available. Information on the harvest and use of each of these big game resources is presented below. Appendix 5 lists the scientific and Iñupiaq names of the resources. Other Iñupiaq terminology appears in italics in the text.

In a regional center as large and diverse as Kotzebue, hunting patterns varied greatly and were difficult to describe fully. In particular, there were often significant differences between Native and non-Native hunters in terms of hunting strategies and ethics, means of access, utilization of game parts, and distribution of the harvest. This was especially true for animals such as sheep and bear on which the non-Native sport hunting tradition placed particular value. For example, a non-Native Kotzebue resident might charter an airplane in fall to reach sheep hunting areas, search for and kill a trophy ram, consume the meat in his or her own household, and have the cape and horns mounted for display. A Native Kotzebue hunter might hunt sheep in winter by snowmachine, kill one or more ewes or young rams, eat some of the meat in his own household and distribute the rest widely to other related households, and use the horn for *ulu* handles. These simple characterizations, of course, do not reflect all Native and non-Native hunters, but convey the extent to which hunting patterns vary in Kotzebue.

Caribou

Caribou have been a staple in the diet of the northwest Inupiat for centuries. A member of the deer family, caribou feed on lichens, willow, dwarf birch, grasses, sedges, and succulent plants in summer, switching almost exclusively to lichens in winter. Caribou are herd animals that keep moving to find adequate food. Regular migrations occur annually between calving and wintering areas, although the precise routes, areas, and timing of the migration are somewhat unpredictable between years.

The Western Arctic caribou herd inhabits northwest Alaska. In 1986, this was the largest caribou herd in the state, numbering about 230,000 animals. Recent censuses indicate that the herd has been increasing at an annual rate of 7 to 17 percent since 1976 when the herd reached a low of 75,000 animals (Alaska Department of Fish and Game 1988). The Western Arctic herd ranges over 60,000 square miles during its annual migration. Calving grounds are on the North Slope on the upper Utukok and Colville rivers, with summering areas further west on the coastal plain and in the Lisburne Hills. In August, caribou begin moving east and south to wintering areas south of the Waring Mountains and Selawik Hills. Female caribou and their calves migrate first, followed by bulls. In March, caribou begin moving north again. Although this general migratory pattern has been stable over the past decade or so, the specific areas caribou use each year vary.

Caribou have not always been as plentiful in northwest Alaska as they are today. Caribou were virtually absent from the Kobuk River valley from the late 1800s to the mid-1940s, at which time local residents traveled north to the Noatak River to hunt them (Foote 1966:32-33). In 1949, caribou appeared in the Cape Krusenstern area during the fall migration for the first time in this century (Uhl and Uhl 1977:44). Although scientists do not know exactly how these shifts in the range of the herd correspond with the herd's size, recent observations suggest that the herd's range extends as its population increases. With these shifts in caribou population and range, local residents' use of caribou and their harvest strategies have changed accordingly over time.

In the 1980s, the main caribou hunting season for Kotzebue residents was in the fall when the herd migrated south across the Noatak and Kobuk River drainages. Fall was the preferred season because bulls were fat at this time, caribou could easily be harvested in large numbers at key river crossings along their migratory route, and large quantities of caribou could be transported back to Kotzebue more easily by boat than later in winter by sled. Most of the fall hunting took place in September when the weather was cool enough to prevent meat spoilage, but not so cold for freeze-up to pose a threat to boat travel. By mid-October, bull caribou were rutting, giving the meat an unpleasant odor. Hunters avoided taking bulls at this time, preferring young males or females. Caribou hunting by Kotzebue residents generally did not occur in October because freeze-up conditions limited boat travel and caribou were rarely found at this time near Kotzebue where hunters could reach them on foot or with all-terrain vehicles.

Kotzebue residents also hunted caribou, if available, during winter and spring when overland travel was possible by snowmachine or dog team. In the late 1980s, caribou were found at this time of year in scattered groups in the Kiana Hills, Mulgrave Hills, Igichuk Hills, Baird Mountains, and on the "Selawik flats." Caribou were usually taken in smaller numbers in winter and spring than in fall. Cows were preferred at this time because bulls were lean and stringy. By late spring, caribou have moved north to their calving and summering grounds and were generally out of reach of Kotzebue hunters whose focus by that time has turned to marine mammals.

The state-regulated caribou hunting seasons and bag limits in the Kotzebue Sound region in the mid- to late 1980s were liberal and, in general, did not constrain hunting activities. In 1986, the caribou season was open year-round for both sexes except that female caribou could not be taken between May 16 and June 30, the calving period. The bag limit was five caribou per day for subsistence hunters. This bag limit and the year-round open season allowed for flexibility. It enabled hunters to take a sufficient number of animals when caribou were available, an essential hunting strategy with an animal as migratory as the caribou. Hunters were also able to adjust their hunting to other considerations, such as weather, transportation, availability of other subsistence foods, and employment opportunities.

Unlike some communities in the region, Kotzebue hunters frequently traveled long distances in fall to hunt caribou. The most productive fall caribou hunting areas used by Kotzebue residents were the Kobuk and Noatak rivers. On the Kobuk River, Kotzebue residents frequently hunted at "Onion Portage," Hunt River, or anywhere between Kiana and Ambler where caribou could be found. On the Noatak River, hunters typically traveled past the community of Noatak to the Kelly, Kugururok, Nakolik, or Nimiuktuk rivers. Many hunters preferred the Kobuk to the Noatak because it was deeper and less rocky, and consequently easier and faster to navigate with the larger boats and outboard motors commonly used by Kotzebue residents. Some people also considered the Kobuk River a more dependable hunting location with less variation in the migratory route of caribou. Others preferred the Noatak River because of family ties to the community of Noatak or greater familiarity with that area. Hunting destinations on both the Kobuk and Noatak rivers took between four hours and two days to reach by boat, depending on water conditions and size of outboard motor.

Researchers' observations in the mid- and late 1980s showed that fall caribou hunters typically set up temporary camps near key locations where caribou were most likely to cross the river. When caribou were sighted crossing the river, hunters often drove their boats close to the swimming animals. Hunters selected the fattest bulls, shot them in the head with .22 caliber rifles, then hauled them to shore for butchering. This hunting method was practical in that hunters could select the choicest animals with little chance of wounding them or of unintentionally taking cows or calves. In addition, .22 rimfire shells were inexpensive, caused little damage to the meat, and were safer to use than far-ranging ammunition in areas where many boats were hunting. Hunters also used large-caliber rifles to kill caribou on sand bars or river banks where the carcasses could easily be butchered and loaded into a boat.

Between freeze-up and breakup, Kotzebue residents used snowmachines to hunt caribou. In mid-winter, hunters usually harvested caribou only if the animals were wintering reasonably near Kotzebue, but by spring hunters ranged farther in search of caribou on their northward migration. Caribou were often lean at this time of year and thus good for making dried meat (*paniqtuq*)

during the warm, sunny days of late spring. In any season, hunting caribou required knowledge of the land and weather, familiarity with caribou behavior, navigational skills, and survival skills in the event of equipment failure or stormy weather.

Depending on the season, the meaty hindquarters and forelegs of caribou were processed in a variety of ways. In fall, the quarters were usually hung outside or in caches to age and freeze as the weather grew cold. This hanging meat made good frozen meat (*quaq*). Aged caribou meat was also cut into chunks, wrapped, and stored in freezers for later use. In spring and late summer, caribou meat was often cut into flat pieces and dried. At these times of year, the weather was too warm to preserve meat without refrigeration but cool enough and free of flies to make good drying conditions. In the 1980s, dried caribou meat remained a common food both at home and on the trail.

Caribou was prepared for food in a variety of ways. Most commonly the meat and bones were made into soup using basic ingredients such as salt, pepper, onions, rice, and pasta. Large families, in particular, prepared caribou soup in order to make their meat supply last longer. Caribou was also roasted, baked medium rare, fried, boiled, and cooked meat-and-gravy style.

Caribou heart and liver were also commonly eaten; both of these were best fresh. An easily removed, lacy-like layer of mesentery fat was sometimes stuffed into a section of intestine that had been cleaned and turned inside out. This stuffed product (*pisiksisak*) was then boiled and sliced before eating. Caribou tongue was widely regarded as a delicacy and the head was eaten by some households after it had been skinned, cut into pieces, and cooked in a flour-based soup. Caribou feet were sometimes skinned and cooked with beans. Nearly all the caribou bones were made into soup.

The thick layer of fat on fall caribou was a highly desirable item. This fat was often put away in a cool place for later use particularly in the making of Eskimo ice cream (*akutuq*). Because of its nutritional value, *akutuq* has been used for centuries as a survival food for hunters and travelers. To make *akutuq*, caribou fat was cut into small pieces and placed in a cloth bag to be pounded or ground with a meat grinder. The fat was then warmed with seal oil on low heat

until it became liquid. In a large bowl, the melted fat and oil along with some water were gradually stirred with the hand until the mixture became fluffy. Caribou meat or fish was sometimes processed into a fine paste and added to the *akutuq* for flavor and texture. While one person stirred the *akutuq*, another person combined drained berries of any variety with sugar. When the mixture was thick enough, the berries were folded into the *akutuq*.

Kotzebue residents frequently utilized non-edible parts of the caribou for clothing, bedding, and tools. Caribou leg skins were made into skin boots and the hides were used for sleeping pads in camp. Sinew along the spine was sometimes removed while butchering and laid onto a flat surface to dry. This sinew (*ivalu*) was used as sewing thread. Antlers were carved or cut into a variety of tools and handicrafts.

Results from the 1986 survey affirmed that caribou was a staple food for Kotzebue households. Caribou ranked first among all resources in terms of pounds harvested, accounting for 24.4 percent of Kotzebue's total harvest of wild food in 1986 (Table 11). Expanded survey results showed that Kotzebue households took an estimated 1,917 caribou in 1986 for an edible weight of 260,645 pounds (Table 9). The average harvest for Kotzebue households was 340.7 pounds (about 2.5 caribou), with an average per capita harvest of 97.2 pounds (about two-thirds of a caribou).

The number of caribou harvested by each Kotzebue household ranged widely. More than one-half (54.8 percent) of Kotzebue households did not take any caribou. One to two caribou were taken by 19.5 percent of households and 3 to 10 caribou were taken by 19.0 percent of households. About five percent of households took 11 to 20 caribou, and 1.5 percent took 21 to 25 caribou during the study year.

Caribou were harvested by 45.2 percent of Kotzebue households, ranking third behind berries and salmon in terms of harvest participation (Table 9). Caribou was among the most frequently exchanged resources in Kotzebue with 57.9 percent of households receiving caribou and 40.3 percent giving some away. More households (88.1 percent) used caribou during the study year than any other resource. With an abundant caribou population and liberal hunting

regulations, most households that attempted to harvest caribou were successful. Only 4.5 percent of households that tried to harvest caribou were unsuccessful. These were likely young hunters or newly arrived residents who were not skilled in or properly equipped for caribou hunting in the region.

With population fluctuations over time, caribou have undoubtedly not always been as significant a component of Kotzebue's subsistence harvest as they were in 1986. The composition of Kotzebue's annual harvests when caribou have been scarce has not been documented, although other resources in abundance at the time, such as beluga, seals, small game, or fish, likely satisfied the dietary needs of the community. Annual and periodic shifts in harvest composition are inherent in an arctic subsistence economy and the 1986 survey year should not be regarded as typical or static. The 1986 harvest estimates might have little applicability to future years when the availability and abundance of animal populations might have changed.

Moose

Moose are a relatively recent addition to the resource base of northwest Alaska. In the 1940s, moose were present in tributaries of the middle and upper Noatak River, but were not common along its timbered lower sections until after 1960. Uhl and Uhl (1977:51) report that the first moose seen in the Cape Krusenstern area was in 1947, at which time most older people had never seen a moose in their lifetime. Uhl and Uhl (1977:52) also report that Cape Krusenstern residents had no historic traditions of moose utilization and preparation, indicating a long absence of moose from the area. In the upper Kobuk River, moose did not appear until the 1920s, eventually populating the river all the way to the delta. The Iñupiaq term for moose, *tiniikaq*, is adopted from the Athabaskan language of interior Alaska, indicating an unfamiliarity with this animal among the Iñupiat of northwest Alaska (Anderson *et al.* 1977:291).

In the 1980s, moose occurred in suitable habitat throughout northwest Alaska. They feed on willow, birch, and aspen twigs in winter, on sedges, horsetail, and grasses in spring, and on aquatic vegetation and birch, willow, and aspen leaves in summer. The moose population in the Noatak and Kobuk River drainages apparently peaked in the early to mid-1970s and has generally remained stationary into the mid-1980s. In 1986, moose were abundant in most of the Kotzebue Sound area and generally did not receive intense hunting pressure except in certain tributaries of the Noatak River where trophy hunting by non-local residents was popular. Subsistence hunting regulations in 1986 allowed a bag limit of one moose per year with the season opening August 1 and closing December 31 or March 31 depending on the drainage. Resident and non-resident hunting was also permitted, although in some areas the season was shorter than for subsistence hunters.

Moose were definitely secondary to caribou in terms of their importance and desirability as a subsistence food to Kotzebue residents. Local hunters generally concentrated on caribou hunting during fall, although moose were taken for dietary variety and as a supplement to caribou. Some Kotzebue residents chose to hunt moose in fall because, unlike caribou, they could be found fairly near Kotzebue at this time of year. Moose were also taken throughout the winter as the need arose.

Moose was preserved and prepared in ways similar to caribou. Moose meat was most commonly aged and frozen. The head was generally not used for food except for the cartilaginous nose which made a good crunchy meal. Some residents brought moose meat to commercial butchers in local grocery stores to have it ground into hamburger.

Kotzebue residents generally did not tan or smoke moose hides, and as a result seldom salvaged the hides from a hunt. Local seamstresses in Kotzebue occasionally purchased smoked, tanned moose hides from commercial fur companies, although in general moose hide products were not common in the Kotzebue area.

Expanded survey results showed that Kotzebue households harvested an estimated 65 moose in 1986 for an edible weight of 34,721 pounds (Table 9). This was the equivalent of an

average household harvest of 45.4 pounds and an average per capita harvest of 13.0 pounds. Moose accounted for 3.2 percent of the average household harvest in Kotzebue (Table 11). Moose ranked fifth among all resources in terms of pounds harvested following the dietary staples of caribou, bearded seal, salmon, and sheefish.

Moose were harvested by 8.4 percent of Kotzebue households, substantially fewer than the 45.2 percent that harvested caribou (Table 9). Another 18.3 percent of Kotzebue households said they attempted to harvest moose, but were not successful. Because moose are very large animals to butcher and pack, boat-equipped hunters preferred to wait to find one close to a river or lake edge, and were not always successful in doing so. Some households without boats or snowmachines hunted moose on foot without success in the Kotzebue vicinity. In addition, non-Natives who have recently moved to Kotzebue often preferred moose to caribou and might not have had the experience and familiarity with the region to hunt successfully.

Although moose were harvested by a relatively small percentage of Kotzebue households, moose meat was widely distributed with 42.0 percent of households using moose during the study year. Expanded survey results indicated that 6.7 percent of Kotzebue households gave moose away while 34.0 percent received some. In the event of a future decline in caribou abundance, moose could become a more prominent resource in Kotzebue's subsistence harvest.

Dall Sheep

Dall sheep are high mountain animals that feed on grasses, forbs, and willows. In the Kotzebue area, sheep are found in the Baird and DeLong mountains, the ranges forming the western end of the Brooks Range. Sheep meat is very tasty, but these animals live in rugged terrain and are not nearly as numerous as moose or caribou. For these reasons, sheep were not a major component of the Kotzebue diet in the 1980s.

Early in the 20th century, men from the Kotzebue area hunted on foot in summer for sheep, caribou, and bear (Uhl and Uhl 1977:55). Obtaining skins was the main purpose of this hunt as

summer caribou and sheep skins were the most suitable for clothing. As late as the 1940s, Kotzebue men took kayaks up the Noatak River to the mouth of the Agashashok River and from there walked to sheep hunting areas (Georgette and Loon 1991:25).

In the 1980s, four harvest patterns characterized sheep hunting by Kotzebue residents. The first occurred during August and September when some Kotzebue residents used small airplanes to reach sheep hunting areas in nearby mountains. This hunt generally attracted a small number of Kotzebue sport hunters in search of a trophy animal. Many non-local state residents also flew out of Kotzebue at this time of year to hunt sheep. The bag limit for this hunt was one ram with 7/8 curl or larger. This was a registration hunt that closed when a set quota was reached, although in some years the quota was not attained and the season remained open its entire length.

A second harvest pattern was for river-based caribou hunters on the Noatak River to take sheep in fall at "Noatak Canyon," about 100 miles above the Noatak River mouth. There sheep could occasionally be found along the cliffs lining the river. If a sheep were spotted, hunters often took it, even if it did not meet the 7/8 curl requirement. Because few Kotzebue residents traveled this far upriver, the number of sheep harvested this way was undoubtedly small and likely did not occur every year.

Third, a small number of Kotzebue residents hunted fall sheep by "four-wheelers" in the Igichuk Hills, transporting the vehicles by boat from Kotzebue. In terms of land use, this was a fairly new hunting pattern as sheep first moved into the Igichuk Hills in the 1970s after an absence of at least 100 years and possibly much longer (Uhl and Uhl 1977:55). In other respects, this represented a very old pattern of adaptation by subsistence hunters to shifting species abundance and availability.

The fourth type of sheep hunting occurred with snowmachines in late winter and spring in the Baird Mountains. As the days lengthened, some Kotzebue residents took hunting trips specifically for sheep while others hunted sheep as they traveled in the mountains in search of furbearers or caribou. The researchers knew of one Kotzebue resident who used a dog team to take a sheep in the 1980s. In 1986-87, this winter sheep hunt was managed as a subsistence hunt

open only to residents of Game Management Unit 23. The bag limit was one sheep. The hunt that year had a quota of 30 sheep, but to the department's knowledge similar quotas in previous years had not been met.

Expanded survey results showed an estimated harvest of 18 sheep by Kotzebue residents in 1986. This harvest yielded 1,820 edible pounds or an average household harvest of 2.4 pounds (Table 9). The average per capita harvest was 0.7 pound. Sheep made a very small contribution (0.2 percent) to Kotzebue's total harvest of wild food (Table 11). Of the 90 sampled households, three took sheep during the study year; their harvests ranged from one to three animals. Two of these households used boats to hunt sheep, while the third used a snowmachine. Because only a small number of sampled households took sheep, the statistical error involved in expanding the sample to the entire community is significant, thereby reducing the confidence of the estimated harvest.

Fewer Kotzebue households (1.5 percent) harvested sheep than any other big game species; 5.7 percent of households said they tried to harvest sheep (Table 9). Sheep played a minor role in resource exchange in Kotzebue with 4.0 percent of households receiving sheep and 1.1 percent giving some away. Some Kotzebue households received sheep meat from families in Noatak (the most active sheep hunting community in the region) and from non-local sport hunters who often gave away meat they did not want to transport home.

Brown Bear

In the 1980s, brown bears were found throughout the Kotzebue Sound region, but were most common in the coastal tundra areas and in the Noatak River drainage. They were among the most respected animals by both Iñupiaq and non-Native hunters. Bears were sometimes called *pisruktuat*, or wanderers, and were prominent in Iñupiaq mythology. In the mid-1980s, Iñupiaq elders advised hunters not to speak badly about bears, brag about their bear hunting abilities, or even talk about their hunting plans because bears have acute hearing, particularly while denning

in winter, and hear all that is said about them. Hunters' success and safety depended on following these rules.

In the 1980s, Kotzebue residents exhibited a variety of attitudes toward brown bears. Some regarded them as nuisances around camps and fish caches and as a threat to berry pickers and campers. Others hunted them for the trophy value of the hide. Still others hunted them for food. In this latter case, hunters were often originally from inland communities with a tradition of using brown bears for food, such as Noatak, Selawik, and the Kobuk River communities. Because coastal brown bears often feed on dead marine mammals, many residents of coastal communities considered bear meat unpalatable and rarely used them for food (Loon and Georgette 1989).

Kotzebue residents hunted brown bears in spring and fall when they were fat and their hides in good condition. If they were to be used for food, inland brown bears were preferred. Bear hunting was often opportunistic, although trophy hunters from Kotzebue often went out specifically in search of a bear. Hunting took place with boats, snowmachines, and airplanes. In some years, one or more bears were killed in defense of life or property in Kotzebue area camps. The hunting of denning bears in winter was rarely, if ever, practiced in the 1980s, although this occurred in the past in other parts of the region.

When an Iñupiaq hunter took a bear for food, the meat and fat were distributed to many households. Iñupiaq elders were especially delighted to receive bear meat and fat. The fat was highly prized and was usually aged, then boiled or fried, and stored in jars or cans. Berries and roots were commonly stored in the fat. Bear fat was nutritious, kept travelers warm, and was valued as a medicine for colds, sore throats, flu, poor appetite, and skin sores. Bear meat was made into soup or roasted. The hide was used as a mattress in camp and as survival gear when traveling in winter. Bear hides were also made into parka ruffs and Eskimo boots.

Expanded survey results showed that an estimated nine brown bears were harvested by Kotzebue residents in 1986 for an edible weight of 740 pounds (Table 9). This equaled an average household harvest of one pound. Brown bear accounted for a tiny percentage (less than 0.1 percent) of Kotzebue's overall harvest by weight. Survey results showed that 2.2 percent of

Kotzebue households harvested brown bear; 4.8 percent of households tried to harvest one. Researchers did not know how many brown bears were taken for the hide only and how many were used for food. Of the 90 sampled households, one killed a brown bear; this household hunted with a Shungnak resident. The Kotzebue hunter kept the hide while the meat was taken back to Shungnak and distributed to households there. It is not known to what extent this pattern was typical.

Black Bear

Black bears are smaller than brown bears and generally found in timbered habitat. In northwest Alaska, black bears inhabit the Kobuk and Selawik River drainages, but are absent from the coastal areas, including the Kotzebue vicinity, and the Noatak River drainage. Kotzebue residents widely regarded black bear meat and fat as edible and preferred it to brown bear. Most black bear hunting by Kotzebue residents took place incidental to fall caribou hunting on the Kobuk River. The meat and fat were used similar to brown bears.

Expanded survey results showed that an estimated 20 black bears were harvested by Kotzebue residents in 1986 for an edible weight of 1,783 pounds (Table 9). This was an average household harvest of 2.3 pounds. Black bears contributed a very small percentage (0.2 percent) to Kotzebue's overall harvest of wild food (Table 11) Black bears were harvested by 2.6 percent of Kotzebue households; 8.0 percent of households tried to harvest a bear, or would have taken one had they seen one. Black bear meat and fat were given away by 2.6 percent of households and received by 0.4 percent of households.

MARINE MAMMAL HUNTING

The major marine mammal resources in Kotzebue were bearded seal, ringed seal, beluga, and spotted seal. Of these, bearded seal was overwhelmingly the most significant resource in

1986 in terms of harvest quantity, accounting for 69.1 percent of Kotzebue's marine mammal harvest by weight and 19.0 percent of Kotzebue's total wild food harvest by weight. Ringed seal ranked second by weight in Kotzebue's 1986 marine mammal harvest followed by beluga and spotted seal (Table 11). Other marine mammal species occasionally harvested by Kotzebue residents included ribbon seal, walrus, and polar bear. Whale species other than beluga also occurred in Kotzebue Sound; in 1992, for instance, a young gray whale was caught in a beluga net near *Sisualik*. Harvest of other whales, however, was rare in the Kotzebue vicinity. Information on the harvest and use of specific marine mammal resources is presented below. Appendix 5 lists the scientific and Iñupiaq names of the resources. Other Iñupiaq terminology appears in italics in the text.

More so than with most resources, successful marine mammal hunting depended not only on species abundance, but also on environmental factors such as weather and ice conditions. For example, even in years when a seal population might be high, hunting success might be poor as a result of unfavorable winds that prevent hunters from reaching or finding seals. These environmental conditions vary each year, so that no two years are exactly the same. Marine mammal harvest information presented in this report therefore cannot be construed to apply equally to all years.

In the 1980s, most marine mammal hunting by Kotzebue residents took place from Kotzebue or from camps in the *Sisualik*-Cape Krusenstern area to the northwest. However, some residents traveled to other communities, particularly Kivalina and Point Hope, to participate in marine mammal hunting activities. For example, one household was a member of a Point Hope whaling crew that landed a bowhead whale, while another shot a polar bear and a third killed a beluga while visiting their home community of Kivalina. Some of the harvests of Kotzebue residents thus occurred within the context of another community's hunting tradition.

Although in 1986 marine mammals comprised a relatively large portion (27.5 percent) of Kotzebue's total harvest (Fig. 19), the number of households participating in marine mammal hunting was small in comparison to most other resource categories. For example, 75.1 percent of

Kotzebue households harvested fish and almost one-half (48.6 percent) harvested big game, but only 18.3 percent of households harvested marine mammals (Fig. 18). Marine mammal hunting was generally a more specialized activity than, for instance, caribou hunting or salmon fishing.

Native households in Kotzebue harvested an average of 200 times more marine mammals than non-Native households (Fig. 21). This was largely due to culturally based food preferences; seal oil, for example, was seldom used by non-Native households, but remained a staple food of Iñupiaq families throughout the region. Regulatory restrictions also likely contributed to the low marine mammal harvest by non-Natives. Since 1972, the federal Marine Mammal Protection Act has allowed only Alaska Natives to hunt marine mammals, thereby precluding non-Natives from harvesting, but not from using, these species.

Bearded Seal

Bearded seal, locally known by its Iñupiaq name, *ugruk*, was a dietary staple in the Kotzebue Sound region in the 1980s. Its importance cannot be overemphasized. Coastal communities in Kotzebue Sound have depended on oil (*uqsruq*), meat (*mipkuq*), and blubber (*uqsruġaq*) of the bearded seal for nutrition, calories, and medicine for generations. Bearded seal provided the most flavorful and preferred seal oil, a daily food item in the diet of northwest Iñupiat and a hallmark of *niquipiaq* (Eskimo food). Seal oil was shared, sold, and traded for other goods with residents of inland communities who did not have access to marine mammals.

Bearded seals are the largest of the northern phocids, reaching maximum weights of 700 to 800 pounds. Their seasonal movements cover great distances each year and are associated with the advance and retreat of the sea ice. In winter, bearded seals are found in the Bering Sea, migrating northward in spring as the sea ice recedes. They summer at the margin of the multi-year ice in the Chukchi and Beaufort seas, migrating south again prior to or during freeze-up (Nelson, Burns, and Frost 1985:57).

Bearded seals feed primarily on benthic organisms such as clams, shrimp, crabs, and sculpins and thus typically inhabit areas of relatively shallow water where they can dive to the bottom. Breeding occurs from April to early June with pups born on ice floes the following spring. Although no studies have been specifically designed to assess bearded seal numbers, all available evidence indicates the population is stable and healthy (Nelson *et al.* 1985:58-59). In 1986, there were no federal-regulated seasons, bag limits, methods and means restrictions, or reporting requirements imposed on bearded seal hunting by Alaska Natives, only the requirement that the take was nonwasteful.

Most *ugruk* hunting by Kotzebue residents took place in late spring when the seals migrated through Kotzebue Sound on their way north with the ice. The most intensive period of *ugruk* hunting typically occurred in June after the ice broke up between *Sisualik* and Kotzebue and travel by boat was possible among the ice floes. In some years the hunting season extended into July if sea ice remained in Kotzebue Sound. In the 1980s, hunters and their families often set up camps for a month or more along the *Sisualik*-Cape Krusenstern coast to hunt marine mammals. Hunters who were employed in Kotzebue took leave from their work or hunted in their free time, bringing their catch back to Kotzebue to be processed.

Kotzebue hunters also occasionally took bearded seals in April and May although not as many as in June. At this time of year, men traveled by snowmachine out onto the sea ice in search of seals sunning on the ice. In fall when slush began to run from the rivers, juvenile bearded seal, known locally as *ugruchiaq*, appeared in the coastal water near Kotzebue and hunters set out in their boats for the last bearded seal hunt of the season. For those based in Kotzebue, this fall seal hunting usually ended by late October when the channel in front of Kotzebue froze and boat travel was no longer possible.

Bearded seal hunting groups in spring and fall were typically composed of immediate and extended male family members. It was rare for women to hunt marine mammals, although some did and others occasionally accompanied their husbands. Depending on ice conditions, Kotzebue residents hunted *ugruk* anywhere from right near shore to 40 miles offshore. Most hunting took

place with high-powered rifles in 22- to 24-foot open skiffs . Hunters tried to kill seals on the ice with one shot to prevent losing them in the water where in late spring they sank quickly. Seal carcasses from irretrievable kills that washed up on Kotzebue Sound beaches were sometimes salvaged by local residents for food or dog food if not too badly deteriorated. After a successful hunt, the hunting party divided its catch among members of the group.

Women were responsible for butchering and processing bearded seals. Mostly these were hunters' wives assisted by daughters, sisters, or other female relatives or friends. In exchange for their labor, these helpers received a share of seal oil, blubber, and meat which might amount to five gallons or more. It took a skilled, experienced person to properly process seals into seal oil and other products. Because the *ugruk* hunting season was short and large quantities of seal oil were needed for the coming year, women worked very hard processing seals and storing the products, especially because weather can be warm in late spring and quickly spoil the harvest. In addition, hunting groups preferred not to return home until they had a boatload of seals and women then had a huge quantity of meat and blubber to process at one time. One respondent commented that some people did not appreciate the amount of work it took to process *ugruk*; he once refused an offer of four strips of dried pike for five gallons of seal oil, feeling that the latter was worth far more than that.

Hunters usually gutted seals in the field to prevent spoilage to the meat. To butcher an *ugruk*, women used an *ulu* or woman's knife to cut a straight incision from the seal's jaw through the front legs to the hind legs. Starting from the mid-section of the seal, the meat was separated from the blubber and skin with an *ulu* until the whole carcass was detached. Four big slabs of meat were then removed from the back and front of the carcass and hung on outdoor racks to dry and let the blood drain. The ribs, back bones, and pelvis bone were separated into pieces.

After letting the skin and blubber sit for a day, women used an *ulu* to separate the blubber from the skin. A board, supported by the knee, was placed under the seal skin in a slanting position. The *ulu* was pushed with a downward motion between the skin and the blubber until the blubber fell away. The slabs of blubber were sliced into strips and put into buckets or barrels.

Scraps of seal blubber were put aside for preserving seal flippers. The buckets or barrels of blubber were put in a cool place where they rendered into oil within a week or so. A large bearded seal yielded up to 15 to 20 gallons of seal oil.

When the top layer of the slabs of meat were dry, they were sliced open and spread into larger and thinner pieces. To prevent maggots from infesting the meat, women carefully checked for and removed fly eggs, or burned a *puyuq* or smudge pot near the hanging meat to keep flies away. When these thinner pieces of meat were dry, they were cut into long strips to dry again. This repeated cutting and drying of the meat took more than a week. The final dried product was called "black meat" (*mipkuq*). Depending on whether the family wanted hard or soft black meat, women either partially dried or completely dried the meat. When the black meat finished drying, it was cut into small pieces and placed in the buckets or barrels of rendering blubber. This black meat in seal oil was one of the most common *niqipiaq* (Eskimo food) items eaten by Kotzebue residents.

Boiled and braided seal intestines were sometimes preserved in seal oil also. In hot weather, half-dried ribs and strips were boiled, dried again, and put in seal oil to prevent spoilage. Fresh bearded seal meat was boiled or roasted with onions and eaten with pickles and mustard. A local delicacy for some residents was fermented seal flippers (*utniq*). The flippers were put in a small, raw seal skin filled with blubber scraps and buried in the ground. The hair fell off as the flipper fermented.

Bearded seal skins were extremely valuable as hard-bottomed soles for skin boots. These skins were superior to all others in terms of durability and pliability. Bearded seal skin was also traditionally used for rope, snowshoe webbing, boat coverings, dog harnesses, snares, and spears, but this was rare in the 1980s.

With as central a role as bearded seal had in the northwest Iñupiaq diet, it was not surprising that this resource accounted for 69.1 percent of Kotzebue's harvest of marine mammals and 19.0 percent of Kotzebue's total harvest of wild food (Table 11). In terms of edible weight, bearded seal was second only to caribou in its contribution to Kotzebue's overall harvest

(Fig. 20). Expanded survey results showed that in 1986 Kotzebue hunters harvested an estimated 537 bearded seal for an edible weight of 202,427 pounds (Table 9). This was equivalent to an average household harvest of 264.6 pounds (about two-thirds of a seal) and an average per capita harvest of 75.6 pounds. Harvests of sampled households ranged from 0 to 10 bearded seals. One household commented that 1986 was an exceptionally good year for *ugruk* hunting.

Kotzebue hunters harvested adult bearded seal in greater numbers than juvenile bearded seal during the study year. Of the 537 bearded seal taken, 94 (17.5 percent) were juveniles and 443 (82.5 percent) were adults (Table 9). Because of their smaller size, the juveniles accounted for 8.2 percent of the bearded seal harvest by weight, or 16,556 edible pounds.

Among Kotzebue residents, seal hunting was a relatively specialized activity compared with caribou hunting, salmon fishing, or berry picking. Not only did it require specialized equipment and a great deal of skill, but many Kotzebue residents originated from communities without seal hunting traditions and were raised without the requisite knowledge or experience. All these factors resulted in comparatively few Kotzebue households harvesting bearded seal. Expanded survey results showed that 14.8 percent of households harvested adult bearded seal and 7.0 percent harvested juvenile bearded seal (Table 9). Like most resources, bearded seal was widely shared by successful hunters. Slightly more than one-third (34.2 percent) of Kotzebue households said they received bearded seal while 14.3 percent said they gave some away. A total of 47.2 percent of Kotzebue households used bearded seal during the study year.

Ringed Seal

Ringed seal was another significant marine resource for Kotzebue residents, generally not as highly valued as bearded seal, but available to hunters during a longer portion of the year and thus a mainstay in the diet. Ringed seals were locally known in English as "real seals." Ringed seals were widespread and abundant throughout the ice-covered ocean waters of the north and were the only northern seals that regularly inhabited the fast ice where they maintained breathing

holes. The greatest ringed seal densities were found in the fast ice with densities in the pack ice much lower (Frost 1985:81).

Most ringed seals that wintered in Kotzebue Sound and the Chukchi Sea migrated north in spring with the receding sea ice to spend the summer in the pack ice. Some, mainly juveniles, summered in ice-free areas. In fall, many ringed seals migrated south again in front of the advancing pack ice. Ringed seals feed mostly on small fishes and crustaceans with arctic and saffron cod comprising most of their winter diet. Seals were fattest in fall and winter and leanest in late spring and early summer (Frost 1985:81-84).

In the 1980s, ringed seals were hunted by Kotzebue residents throughout the winter and spring. In the darkness of winter mornings, it was not uncommon to see hunters warming up their snowmachines and loading their sleds with small, rectangular, plywood boats. Hunters traveled by snowmachine to leads in the sea ice where they hunted seals, using the boat or a hook and line to retrieve them. Hunting from leads continued into the spring, intensifying in April and May and lasting until the sea ice became unsafe for travel. In winter and spring, ringed seals were fat and rarely sank when shot in the water. In June, ringed seals were hunted from motorized boats in conjunction with bearded seal hunting. Seals were shot in the water or while lying on the ice, although at this time of year they sank quickly. Camp residents along the northern shore of Kotzebue Sound sometimes shot ringed seals in late June from the beach as the animals swam among the broken ice (Uhl and Uhl 1977:130). Occasionally ringed seals were taken in fall when ice began to run in the channels near Kotzebue.

Ringed seal blubber was processed similar to bearded seals, with the blubber rendered into seal oil for home use or for trade or sale to inland communities. Ringed seal meat was usually eaten fresh or used for dog food; dried meat from ringed seals was considered inferior to *ugruk* and not commonly used. The skin provided material for clothing and other items, of which the most important historically was the seal poke (*puuq*) for storing blubber and oil (Uhl and Uhl 1977:156).

Expanded survey results showed that in 1986 ringed seal ranked sixth among all resources in its contribution to Kotzebue's harvest of wild food, following caribou, bearded seal, salmon, sheefish, and moose. Ringed seal accounted for 3.0 percent of Kotzebue's total harvest and 11.1 percent of Kotzebue's marine mammal harvest (Table 11). Kotzebue residents caught an estimated 440 ringed seals in 1986 for an edible weight of 32,580 pounds (Table 9). The average household harvest was 42.6 pounds (somewhat more than one-half a seal) and the average per capita harvest was 12.2 pounds.

As stated above, marine mammals were typically hunted by a relatively small proportion of Kotzebue residents. Ringed seals were no exception. Expanded survey results showed that 9.9 percent of Kotzebue households attempted to harvest ringed seals; all of these were successful (Table 9). Individual harvests of sampled households ranged from 0 to 30 seals. Successful seal hunting took a high level of skill and experience as well as specialized equipment.

Ringed seal was used by 17.3 percent of Kotzebue households, considerably fewer than used bearded seal (Table 9). Exchange of ringed seal was also more limited; 4.8 percent of Kotzebue households gave some away while 7.4 percent received some.

Spotted Seal

The third seal species common to Kotzebue Sound was the spotted seal. Until recently, the spotted seal was considered a northern subspecies of harbor seals, but additional studies have concluded that the spotted seal warrants distinction as a separate species (Lowry 1985a:91).

Spotted seals spend the spring along the southern edge of sea ice in the Bering Sea where they pup, breed, and molt. In summer, they are found primarily in coastal waters in the Bering and Chukchi seas, often in areas frequented by beluga whales. Although some spend the summer in pack ice, others haul out on mainland beaches, islands, and bars. They feed on abundant spawning fishes such as herring, capelin, smelt, saffron cod, and arctic cod. Unlike ringed seals

which winter in fast and pack ice, spotted seals are poorly adapted to winter arctic ice conditions and move south with the arrival of freeze-up (Lowry 1985a:91-93).

Spotted seals were not as prominent in Kotzebue's seal harvest as bearded and ringed seals. However, spotted seals were the only seals common in the Kotzebue area during ice-free months (July until late September) when bearded and ringed seals were further north with the pack ice. Although spotted seals were occasionally taken in summer, they were hunted most intensively in fall when ice began running from the rivers into Kotzebue Sound (Uhl and Uhl 1977:34-37). At this time of year they were fat and abundant. On calm, fall days, Kotzebue residents often watched hunters in boats pursue seals close to town.

Expanded survey results showed that Kotzebue residents harvested 201 spotted seals in 1986 for an edible weight of 19,737 pounds (Table 9). This was an average household harvest of 25.8 pounds (about one-fourth of a seal) and an average per capita harvest of 7.4 pounds. Harvests of sampled households ranged from 0 to 40 seals. Spotted seal ranked ninth among all resources in pounds harvested, accounting for 1.8 percent of Kotzebue's total harvest of wild food (Table 11). Among marine mammals, spotted seal followed bearded seal, ringed seal, and beluga in terms of pounds harvested, accounting for 6.7 percent of Kotzebue's marine mammal harvest.

Seal hunting was a specialized activity in which relatively few Kotzebue residents participated; 6.2 percent of households harvested spotted seal in 1986 (Table 9). An additional 1.2 percent of households attempted to harvest this seal, but were not successful. Spotted seal was not a widely exchanged resource with 3.0 percent of households receiving some and the same percent giving some away. A total of 8.5 percent of Kotzebue households used spotted seal during the study year.

Ribbon Seal

A close relative of the ringed and spotted seal, the ribbon seal is usually found far from shore. They spend winter and spring in the ice front in the Bering Sea, but unlike other

ice-associated seals do not appear to migrate north with the receding ice nor move into coastal waters in summer. Sea ice was essential for ribbon seal pupping, breeding, and molting, but not necessary subsequent to these. Although some ribbon seals were found in the Chukchi Sea in late spring and summer, most remained in the ice-free waters of the Bering Sea (Lowry 1985b:73).

As a result of their geographic distribution, ribbon seals were rarely seen by Kotzebue hunters. Hunters did take them, however, when the opportunity arose. Uhl and Uhl (1977:35) report that in some years no ribbon seals were caught, while in other years seven or eight were caught by Kotzebue Sound hunters. Ribbon seals were often molting when taken in the Cape Krusenstern area.

None of the sampled households in this study harvested or used ribbon seal in 1986, although some hunters said they would have taken one given the opportunity. With a resource as infrequently used as ribbon seal, it might be the case that a few Kotzebue households used this resource, but were missed in the sampling of households.

Beluga

The beluga is a comparatively small white whale found primarily in arctic and subarctic waters. Adult belugas range from about 10 to 15 feet in length and from about 1,000 to 2,600 pounds in weight. In winter, belugas are found in drifting ice from Alaska to Siberia and in open water in the pack ice of the Bering and Chukchi seas. In summer, belugas occur in the Bering, Chukchi, and Beaufort seas, primarily in coastal areas and along the ice pack edge. Belugas leave the coastal areas between late summer and late fall, moving south with the advancing ice pack (Lowry 1985c:5). In general, belugas are available to coastal hunters in spring (April until mid-June) when the whales migrate north through the lead systems in the Bering and Chukchi seas and during the open water season in summer when they occur in nearshore coastal areas. This latter period was the most important for beluga hunting by Kotzebue residents.

In Kotzebue Sound, major beluga hunts have traditionally occurred at Elephant Point, about 60 miles southeast of Kotzebue, and at *Sisualik* (Sheshalik on U.S.G.S. maps), about ten miles northwest of Kotzebue. Kotzebue residents traditionally hunted in late June and early July at this latter location, whose Inupiaq name means "place where beluga whale are found." Until the mid-1960s, this beluga hunt was a major harvest activity for Kotzebue residents, providing a substantial quantity of meat, muktuk, and oil. An illustrative description of beluga hunting at *Sisualik* was written in 1960 (Foote and Williamson 1966:1082):

...Primitively the beluga were herded by a group of kayakers into very shallow water and there harpooned and speared. A great killing could be made so long as the whales were kept in shallow water, for they could not then submerge enough to swim rapidly. This practice was abandoned when the Eskimos began to use power-driven boats, but the excitement of the old method of hunting is part of the conversation of all Eskimos past middle age. They say that before motors became common in Kotzebue Sound the beluga used to come very close to shore and enter the lagoon behind Sheshalik spit (Imaruruk) and that, in general, they were easier to hunt.

Today the beluga is shyer and is therefore more actively pursued. One method of hunting is to anchor the boat in the Strait between Kotzebue and Sheshalik and to keep watch for gamms of whales entering or leaving Hotham Inlet. Hunters attempt to herd the whales into water no more than 10 feet deep before they begin to fire. The second method is to cruise about looking for whales. Although the latter method improves the chances of seeing a gamm, the gas consumption is higher and the whales are made uneasy by the sound of the motor. When the hunters wait quietly the whales may surface so close that they can almost be speared....

Whenever the whale surfaces within shooting range, the hunter fires at it if he is quick enough....The first few shots seldom kill a whale: a chase may last for two hours or more, although a half hour is more nearly average. When a whale is so badly wounded that the boat can overtake it while it is at or near the surface, it is harpooned as forcefully as possible. If more than one party of hunters is shooting at a whale, the first to get a harpoon into it firmly may claim possession....

The three largest whales measured for a competition in Kotzebue's Fourth of July celebration were, respectively, 15'4", 15'1-1/2", and 15'1-1/4".... Most of the whales taken were about ten feet long and weighed an estimated average of 1,000 pounds.... I counted 41 belugas killed last summer. There were another half dozen or more brought in during my absences. The total is about 50.

Organized, large-scale beluga hunts diminished after the mid-1960s. In the 1970s and 1980s, belugas were still taken by Kotzebue and *Sisualik* residents, sometimes in substantial numbers, although hunters said the whales no longer congregated as densely in the hunting area and were more difficult to drive (Seaman and Burns 1979:9). Some respondents attributed the changing behavior of whales to increased boat traffic, partly a result of the development of a commercial salmon fishery after 1962. Since the early 1980s, there has been increasing concern

among hunters and biologists about an apparent marked change in the distribution and/or abundance of beluga whales in Kotzebue Sound. Very few belugas were seen in all of Kotzebue Sound in 1986, and the mid-1980s were poor for beluga harvests in the area (Frost and Lowry 1986:i). Local residents almost unanimously attributed this change to increased boat traffic accompanied by use of large outboard motors. Residents have also noticed an increased presence of killer whales in Kotzebue Sound. Other Kotzebue residents added that belugas no longer frequented Kotzebue Sound because local hunters have not observed traditional hunting rules.

Kotzebue hunters also occasionally took belugas in May and early June when whales were found in open leads in the sea ice during spring seal hunting. In some years, ice conditions caused belugas to become concentrated in narrow leads and large harvests were possible. Uhl and Uhl (1977:39) report that belugas were sometimes shot from the beach as they followed the shore north from *Sisualik*. In the 1980s, Kotzebue residents increasingly set large-mesh nets for belugas in late June and July near Sadie Creek or between Kotzebue and *Sisualik*. One hunter said that these nets primarily caught young belugas and that a growing proportion of the *Sisualik* beluga harvest in the late 1980s was taken with nets.

Kotzebue residents also increasingly participated in the whaling activities of Kivalina, a coastal community about 80 miles northwest of Kotzebue. Bowhead and beluga whaling there occurred in April and May from the edge of the nearshore lead. Modern whaling by Kivalina residents resumed in 1966 after a lapse of many years (Burch 1985:54). One Kotzebue hunter said that since 1982 his beluga hunting area has expanded to the north as he started hunting with Kivalina people. This may be a new, perhaps temporary, adaptation to the decline of belugas in the *Sisualik* area. In addition, the Kivalina hunt took place in spring and did not conflict with the summer commercial fishing season in Kotzebue Sound.

According to the expanded survey results, Kotzebue households harvested 20 beluga in 1986 for an edible weight of 20,165 pounds (Table 9). This was an average household harvest of 26.4 pounds and an average per capita harvest of 7.4 pounds. Beluga accounted for 1.9 percent of Kotzebue's total harvest of wild food, ranking eighth among all resources (Table 11).

The 90 sampled Kotzebue households reported a harvest of two belugas. One of these belugas was taken by a Kotzebue resident originally from Kivalina who returned to his home community to hunt. Most of this whale was distributed to Kivalina families. The estimated 1986 harvest of 20 belugas might be high. In the household survey, harvest quantities for infrequently harvested resources such as beluga had broad confidence intervals (170 percent in this case), and Kotzebue's actual harvest might be anywhere from the known two to 54. Another source indicated that the known beluga harvest for the *Sisualik* area in 1986 was three whales (Lowry, Burns, and Frost 1987). Because both Noatak and Kotzebue residents camp at *Sisualik* and participate in the beluga hunt, these kills cannot necessarily all be attributed to Kotzebue residents. In addition, some Kotzebue residents, as described above, participated in beluga hunts in other communities such as Kivalina, Buckland, or Point Hope. Data on known beluga harvests in the *Sisualik* area since the late 1970s are presented in Table 13 (Lowry, Burns, and Frost 1987; Seaman and Burns 1979:25). As evident from this table, reported beluga harvests varied widely from year to year.

Only a small percentage (2.6 percent) of Kotzebue households harvested beluga in 1986, although 13.0 percent said they tried, but did not catch any (Table 9). Beluga muktuk, called "white muktuk," was a much desired food item among Kotzebue residents. With the diminished local harvest, many residents now depended on friends or relatives in Kivalina, Buckland, Point Hope or elsewhere for a taste of beluga. Survey results indicated that 16.6 percent of Kotzebue households received beluga in 1986, while 4.7 percent gave some away. A total of 19.2 percent of Kotzebue households used beluga during the study year.

Walrus

In Alaskan waters, walrus are restricted primarily to the Bering, Chukchi, and western Beaufort seas. Like other pinnipeds, they are adapted to feeding and traveling in the water while using ice or land to rest, give birth, and care for young. Walrus are benthic feeders and thus

TABLE 13. REPORTED BELUGA HARVESTS FROM SISUALIK AREA, 1977-86.

Year	Number harvested
1977	3
1978	5
1979	2
1980	13
1981	4
1982	25
1983	19
1984	31
1985	13
1986	3

Source: Lowry, Burns, and Frost 1987; Seaman and Burns 1979:25.

generally remain in water shallow enough for them to dive to the bottom. They feed primarily on clams, but also on snails, crab, shrimp, worms, and sea cucumbers. In winter and early spring, walrus occur in the relatively dispersed sea ice of the Bering Sea. As the ice recedes in late spring and summer, most walrus follow it north into the Chukchi and Beaufort seas and summer along the edge of the pack ice. Some animals, mostly mature bulls, remain in hauling areas on land in the Bering Sea. Walrus move southward in fall, passing through the Bering Strait mostly between October and December (Lowry 1985d:17).

Walrus generally pass substantially to the west of Kotzebue Sound on their north-south migrations, and have historically never been of major importance in Kotzebue's subsistence harvest. Stray walrus periodically appeared in the Cape Krusenstern area and a few were usually taken each spring and fall when encountered by seal hunters or other subsistence harvesters (Uhl and Uhl 1977:39). Walrus carcasses washed up each summer on Baldwin Peninsula and Cape Krusenstern beaches, having been killed earlier in the spring by Bering Strait hunters. If not too deteriorated, these walrus carcasses were sometimes salvaged for human use or dog food.

Expanded survey results indicated that Kotzebue hunters took 15 walrus during the study year for an edible weight of 11,807 pounds (Table 9). Walrus accounted for 1.1 percent of Kotzebue's total harvest of wild food (Table 11). The average household harvest was 15.4 pounds and the average per capita harvest was 4.4 pounds. The 90 sampled households reported a harvest of five walrus during 1986 with one household taking two walrus and another taking three. The extent to which Kotzebue's 1986 walrus harvest was representative of other years was not known.

Walrus were harvested by a very small portion of Kotzebue households (0.8 percent) although 5.2 percent said they attempted to harvest one, which in effect meant they would have shot one had they seen one. Walrus was not a major exchange item; 4.6 percent of households received walrus and 2.2 percent gave some away. Walrus was used by 5.4 percent of Kotzebue households during the study year (Table 9).

Polar Bear

The polar bear, a close relative of the brown bear, is most commonly found in association with sea ice in areas where seals are available for food. In general, polar bears follow the seasonal advance and retreat of pack ice, spending summers along the southern portion of drifting pack ice and moving south with the drifting ice in winter. Polar bears feed primarily on ringed seals which they most commonly catch by waiting at a breathing hole or at the edge of open water (Lentfer 1985:29-30).

Kotzebue Sound generally did not provide the ice conditions preferred by polar bears, which included the floe edge, areas of moving ice with 7/8 or more ice cover, and shorefast ice with deep snow drifts along pressure ridges (Stirling, Andriashek, and Calvert 1981 as cited in Amstrup and DeMaster 1988:41). As a result, polar bears were rarely encountered by hunters in Kotzebue Sound, although some were found off the coast northwest of Kotzebue near Kivalina and Point Hope. In 1977, Uhl and Uhl (1977:40) reported that only two stray cubs had been taken by Kotzebue area hunters since 1949 and that no adults had been taken by surface traveling hunters in this century. One middle-aged Kotzebue hunter said that in 1982 he began seeing polar bear tracks for the first time. He believed polar bears were ranging into the Kotzebue Sound area as a result of the 1972 ban on aircraft-supported sport hunting of polar bears. In 1990, one Kotzebue hunter traveling by snowmachine shot an adult polar bear and two cubs about 40 miles west of Kotzebue.

Expanded survey results showed that Kotzebue residents harvested 17 polar bears in 1986 for an edible weight of 6,398 pounds (Table 9). This was equivalent to an average household harvest of 8.4 pounds and an average per capita harvest of 2.4 pounds. Polar bear accounted for 0.6 percent of Kotzebue's edible harvest (Table 11). As with other infrequently harvested resources, the estimated 1986 harvest might be high as a result of imprecision in expanding data for resources that few households harvested. Of the 90 sampled Kotzebue households, one reported harvesting a polar bear. The head of this household was originally from Kivalina and

had returned to his home community to hunt in the spring. The meat of the polar bear was distributed to Kivalina households. The extent to which this represented a typical pattern of polar bear harvest by Kotzebue residents was not known.

Polar bears were taken by a small percentage of Kotzebue households (2.2 percent). A total of 7.8 percent of Kotzebue households used polar bear, most commonly ruffs made from the hide for men's parkas. Polar bear was received by 5.6 percent of Kotzebue households and given away by 2.2 percent of households (Table 9). Most of this exchange occurred between Kotzebue and coastal polar bear hunting communities.

Bowhead Whale

The bowhead whale is a large baleen whale that typically grows to 50 feet or more in length. Each spring (April-June) bowhead whales migrate from the Bering Sea through the Chukchi Sea to the Beaufort Sea, their primary feeding grounds in summer. In September and October, they migrate back to the Bering Sea where they winter in open water areas in the pack ice or near the ice front.

Bowheads generally migrate substantially to the west of Kotzebue Sound, making their occurrence in local waters rare enough that no continuing history of whaling has developed in Kotzebue. However, archeological evidence indicates that some prehistoric settlements in the Cape Krusenstern area hunted whales as intensively as Point Hope and Barrow do today. Some archeologists believe that periodic changes in the direction of spring winds and storms might have altered the location of open leads in some millennia, bringing whales close to the Krusenstern coast (Giddings and Anderson 1986:323).

Bowhead muktuk, locally known in English as "black muktuk," was a prized food item in contemporary Kotzebue. In terms of quantity, it was not of great significance in the local diet but its cultural value was important and most Iñupiaq families in Kotzebue yearned for a taste of it

each year. Bowhead muktuk undoubtedly had one of the most complex and far ranging distribution networks of all resources in arctic Alaska.

Although Kotzebue did not have its own bowhead hunt, some Kotzebue residents participated as crew or support workers in the whaling activities of Kivalina and Point Hope. Often, though not always, these residents were originally from Kivalina or Point Hope and maintained family ties there. One such household was part of the sample for this study. The male head of this household was a member of a crew that took a bowhead in Point Hope, and he subsequently received about 300 pounds of muktuk. One hunter said that Kotzebue residents started whaling in Kivalina in the early 1980s because Kivalina crews needed additional men to help with the hunt. Another hunter said Kotzebue residents first started whaling with Kivalina in the late 1960s when snowmachines began to replace dog teams, making the trip to Kivalina less arduous.

There were other methods by which Kotzebue residents procured black muktuk besides participating in a whale hunt. Friends and family in whaling communities often sent muktuk to Kotzebue residents in successful whaling years. Visitors from whaling communities often brought muktuk as a gift to their hosts in Kotzebue. Many Kotzebue residents attended whaling festivals held in June in Kivalina, Point Hope, Wainwright, and other North Slope communities in successful whaling years. All those attending the festivals received gifts of muktuk, which they brought home and shared among families and friends. Muktuk was also bartered and purchased from individuals and local grocery stores.

The expanded survey results confirmed the visibly widespread distribution of bowhead whale in Kotzebue. A total of 41.1 percent of Kotzebue households used bowhead whale during the study year, compared to 19.2 percent that used beluga whale (Table 9). Only 7.8 percent of Kotzebue households gave bowhead away, while 41.1 percent received some. A very small percentage of households (0.7 percent) participated in the successful harvest of a bowhead whale while 5.6 percent attempted to harvest one. Because whales are so large, researchers did not

include in Kotzebue's harvest the bowhead taken in Point Hope by a crew that included a Kotzebue resident.

SMALL GAME AND FURBEARER HUNTING

In the 1980s, Kotzebue residents hunted a variety of small game and furbearers, including porcupine, beaver, two species of fox and hare, lynx, muskrat, marten, mink, land otter, ground squirrel, weasel, wolf, and wolverine (see Appendix 5 for scientific and Iñupiaq names of resources). Of these, the latter two were the most highly prized for the valuable parka ruffs they provided. Most furbearer hunting took place during months of snow cover (Fig. 17).

In general, small game and furbearers were harvested by a small percentage of Kotzebue households. Red fox and muskrat were harvested by the greatest percentage of households (11.3 percent and 6.3 percent respectively) with most other resources harvested by less than three percent of Kotzebue households. Overall, 17.2 percent of Kotzebue households harvested any kind of small game or furbearer, making it the resource category with the lowest level of participation in 1986 (Fig. 18). However, close to one-half (45.0 percent) of households used small game or furbearers during the study year (Table 9). Information on the harvest and use of small game and furbearer species is presented below.

Kotzebue residents harvested small game and furbearer species for food, fur, or both. Porcupine, for instance, was harvested for food while wolf, weasel, fox, and marten were harvested for fur. Beaver were harvested for both food and fur. Uhl and Uhl (1977:168) report that the meat of mink, wolverine, land otter, muskrat, ground squirrel, and arctic hare was often eaten historically and the skins used in clothing and craft manufacture. In 1986, only beaver, muskrat, hare, and porcupine were reportedly used for food by sampled Kotzebue households, although other households not interviewed might have used other species for food as well. Overall, small game and furbearers contributed a very small proportion (0.3 percent) to Kotzebue's total edible harvest of wild foods in 1986 (Fig. 19).

With the open, treeless terrain of much of coastal northwest Alaska, Kotzebue hunters frequently killed furbearers by shooting with rifles rather than by trapping. This was particularly true for wolf, wolverine, and fox. Lynx and smaller furbearers such as marten, mink, and otter were typically trapped, but none of these furbearers were abundant near Kotzebue in 1986 and few were taken. Kotzebue hunters generally traveled widely in search of furbearers; some hunters and trappers reported traveling as far as the Kiwalik River, the Buckland River, the upper Selawik River, the Squirrel River, and the coast to Kivalina in search of furbearers. Furs of all kinds were still widely used in the Kotzebue Sound region in the home manufacture of parkas, mittens, caps, ruffs, and clothing trim. As a result, most furs taken by Kotzebue hunters were used or traded locally; few were sold to distant fur markets. Table 14 summarizes survey data on the harvest and sale of furs by Kotzebue residents.

Porcupine

Porcupine feed primarily on spruce bark in winter and on a variety of green leaves and buds in summer. Because of their diet, porcupines were generally limited to areas with spruce, cottonwood, and birch, putting the treeless coastal areas out of their normal range. As a result, porcupine were scarce in the immediate Kotzebue vicinity, although hunters sometimes took them when traveling elsewhere in the region.

Not actively hunted, porcupine were usually taken when fat in fall as opportunity and circumstances allowed. Their slow gait made them easy to catch and they were often clubbed with a stick or shot with a small-caliber rifle. Hunters often used an open fire to burn the barbed quills off the back of the porcupine to prevent human injury. Traditional hunters were taught to do this before bringing the porcupine home because the quills were dangerous even when the animal was dead. Porcupine quills were sometimes retained to make earrings and necklaces which were sold locally in stores, homes, and at craft fairs.

TABLE 14. ESTIMATED HARVEST AND SALE OF FURBEARERS, KOTZEBUE, 1986.

Resource	Estimated total number harvested	Estimated total number sold	Percent of harvest sold
Arctic fox	6	0	0
Beaver	12	0	0
Land otter	6	0	0
Lynx	3	3	100
Marten	43	25	58
Muskrat	1,568	0	0
Red fox	178	90	51
Weasel	26	0	0
Wolf	22	0	0
Wolverine	20	0	0

Source: Division of Subsistence, ADF&G, household survey 1986. Harvests and sales reported by sampled households were expanded on a household basis to estimate total community harvests (N = 765 households with 2,681 people).

Porcupine were a very minor resource in the Kotzebue diet during the study year. Expanded survey results showed that an estimated 11 porcupine were harvested by Kotzebue residents in 1986 for an edible weight of 91 pounds or an average of 0.1 pound per household (Table 9). Porcupine were harvested by 1.5 percent of Kotzebue households. No households in the sample gave away or received porcupine, probably because of the animal's small size and the infrequency with which they were taken. Because of habitat limitations, it is doubtful that porcupine are ever taken in substantial numbers by Kotzebue residents.

Beaver

The beaver is a large aquatic rodent weighing 40 to 70 pounds as an adult. Beaver inhabit rivers, lakes, and sloughs where the water is deep enough so as not to freeze to the bottom in winter. Although characteristically associated with timbered areas, beaver are also occasionally found in tundra areas with willow thickets. In spring and summer, beaver feed on willows, bark, and other vegetation while renovating their dens and building escape paths. They winter in their dens, occasionally going in and out to get food from underwater caches. The Kobuk River is the northwestern limit of the beaver population in Alaska, although there have been recent reports of beaver moving into the Noatak River drainage.

Because beaver do not inhabit the immediate Kotzebue area, they were rarely taken by local hunters. Some Kotzebue residents hunted beaver in spring on the Kobuk or Selawik River deltas but this was not a common practice in 1986. Beaver pelts, however, were prized items and widely used by Kotzebue residents for caps, mittens, parka trim, and mukluk tops. Kotzebue residents obtained beaver skins through exchange with inland communities along the Kobuk and Selawik rivers and through purchase from commercial fur buyers.

The expanded survey results showed that Kotzebue residents harvested an estimated 12 beaver in 1986 for an edible weight of 245 pounds (Table 9). Beaver meat and tail were used for food and dog food, providing diversity in the daily fare. The average household harvest of beaver

was 0.3 pound with the average per capita harvest less than 0.1 pound. Beaver contributed less than 0.1 percent to Kotzebue's total harvest of wild food (Table 11). Of the 90 sampled households, two reported harvesting beaver during the study year. One of these households took one beaver and the other took three. None of these pelts were sold, although three were bartered in Kobuk for food, dog food, and lodging.

In 1986, beaver were harvested by a small percentage of Kotzebue households (0.8 percent) (Table 9). Substantially more households (10.3 percent) reported using beaver that year, in most cases the fur. Beaver was received by 9.5 percent of Kotzebue households and given away by 0.4 percent of households. This exchange most likely reflected the movement of beaver skins from Kobuk and Selawik River communities to Kotzebue households.

Snowshoe Hare

The snowshoe hare, or "rabbit," inhabits wooded or brushy areas where it feeds on grasses, buds, twigs, and leaves in summer and spruce twigs, spruce needles, willow bark, and buds in winter. Snowshoe hares are subject to cycles of high abundance and scarcity with extreme highs occurring about every 12 to 15 years (Uhl and Uhl 1977:59).

When available, Kotzebue residents hunted snowshoe hares in winter with small-caliber rifles or shotguns or snared them along their paths in the willows. Boiled rabbit, rabbit flour soup, or roasted rabbit during winter added welcome variety to the diet. In the past, hare skins were used as parka linings for small children, socks, and blankets, although these were not commonly made today.

In 1986, the snowshoe hare population in northwest Alaska was at the low end of its cycle, although local residents commented that hare numbers were starting to rebound. Accordingly, snowshoe hare was a very minor resource for Kotzebue residents during the study year. The expanded survey results showed that Kotzebue residents took an estimated 34 snowshoe hares in 1986 for an edible weight of 84 pounds or 0.1 pound per household (Table 9). The contribution

of snowshoe hare to Kotzebue's total harvest of wild food in 1986 was less than 0.1 percent (Table 11).

Snowshoe hares were harvested and used by a very small percentage of Kotzebue households (0.8 percent), although this figure would likely be higher during times of hare abundance (Table 9). A few households (0.4 percent) gave hare away. No households in the sample reported receiving snowshoe hare.

Arctic Hare

Arctic hares, or "jack rabbits," are much larger than snowshoe hares, weighing 6 to 12 pounds as adults. They are typically found in open tundra areas where they feed on grasses, sedges, lichens, willows, and other dwarf arctic plants. The meat and skins of the arctic hare were preferred to the snowshoe hare. Some Kotzebue hunters occasionally traveled to good "jack rabbit" hunting country in the Kiwalik and Goodhope River drainages on the northern Seward Peninsula. Others hunted arctic hare on the Baldwin Peninsula south of Kotzebue.

Like the snowshoe hare, the arctic hare has population cycles during which they become increasingly plentiful and then scarce. In 1986, arctic hares were not particularly abundant in the Kotzebue area and harvests were consequently low. The expanded survey results indicated that an estimated 64 arctic hares were harvested in 1986 for an edible weight of 400 pounds (Table 9). The average household harvest was 0.5 pound while the average per capita harvest was 0.1 pound. Arctic hare accounted for less than 0.1 percent of Kotzebue's total harvest of wild food in 1986 (Table 11).

Arctic hare were harvested by 1.9 percent of Kotzebue households, although 7.7 percent attempted to harvest them, which in effect meant they would have taken some had they had seen any (Table 9). A very small number of Kotzebue households (0.7 percent) received arctic hare from other households. No households in the sample reported giving away arctic hare. A total of 2.6 percent of Kotzebue households used arctic hare in 1986. Arctic hare harvests likely varied

considerably from year to year in correlation with the cyclical hare population, and thus these survey results should not be assumed to be typical of other years for which data were not collected.

Arctic Fox

The arctic fox, or white fox, is found in the treeless coastal areas of Alaska. Weighing six to ten pounds as adults, arctic foxes have thick white coats in winter and short brown coats in summer. They eat lemmings, voles, birds, eggs, berries, and carrion. In the Kotzebue area, arctic foxes are found along the west side of the Baldwin Peninsula, around Chamisso Island, and occasionally along the coastline to Cape Krusenstern and beyond. They are most common, however, on the sea ice where they feed on seals killed by polar bears. Sea ice conditions and the availability of food determine the abundance and location of these animals.

Some Kotzebue hunters set traps for arctic fox while others shot them with small-caliber rifles when the opportunity arose. In 1986, arctic fox were low in number in the Kotzebue area and few were taken by local hunters. The price paid for an arctic fox pelt in 1986 generally ranged from \$10 to \$35, so hunters had little economic incentive to travel far and wide in search of them. Expanded survey results showed that an estimated six arctic fox were harvested by Kotzebue residents in 1986. None of these furs were sold; instead they were used or traded locally (Table 14). Arctic fox skins were commonly used as trim and ruffs for children's parkas and as trim for slippers.

Few households (0.4 percent) in Kotzebue harvested arctic fox during the study year, although 5.3 percent said they attempted to harvest them (Table 9). In the latter case, households might have set fox traps or might have watched for them while traveling, shooting one if the opportunity arose. A small percentage of Kotzebue households (0.7 percent) received arctic fox from other households. A total of 1.1 percent of Kotzebue households used arctic fox in 1986. As with other furbearers, the harvest of arctic fox by Kotzebue residents undoubtedly varied from

year to year with fluctuations in the fox population, the rise and fall of fur prices, and the availability of other cash-earning endeavors.

Red Fox

Red foxes are considerably more common in the Kotzebue Sound region than arctic foxes, inhabiting both coastal and inland areas. The red fox has several color variations including the silver fox (also called black fox) and the cross fox. The fox population fluctuates in response to the availability of food, particularly hares, ptarmigan, and voles; in 1986 the red fox population in the Kotzebue area was low to moderate and gradually increasing. Red fox pelts were not in high demand in the international fur trade in the mid-1980s and market prices were consequently low. In 1986 red fox pelts generally sold for \$30 to \$50 with top quality red and cross fox bringing \$100 to \$150. Foxes were not used for food in Kotzebue, but the pelts were desirable for parka ruffs for children, mittens, and caps.

Traps were used more often to take red fox than probably any other large furbearer in the Kotzebue area with the exception of lynx. Kotzebue residents often set fox traps on the Baldwin Peninsula close to Kotzebue; foxes were also frequently caught in traps set for wolverine or other furbearers. Still, a substantial portion of the foxes taken, perhaps half or more, were shot with rifles when encountered by winter travelers. With the open terrain around Kotzebue, foxes could be easily spotted from a distance and were sometimes pursued by hunters on snowmachines.

In 1986, red fox were taken in greater numbers than any other furbearer except muskrat. According to the expanded survey results, an estimated 178 red fox were harvested by Kotzebue residents, 90 of which (50.6 percent) were sold to fur buyers (Table 14). Harvests of the 90 sampled households ranged from 0 to 12 foxes. Red fox were also the most widely harvested furbearer with 11.3 percent of households catching one or more in 1986 (Table 9). Fox skins were given away by 4.9 percent of Kotzebue households and were received by 5.9 percent of households. A total of 17.2 percent of Kotzebue households used red fox during the study year.

Lynx

A large, short-tailed cat, the lynx inhabits timbered and brushy areas where its main prey, the snowshoe hare, is found. The lynx population cycles slightly behind the hare population with periodic highs and lows. Lynx pelts were desirable to trappers because they brought high prices in the 1980s. In early 1987, lynx sold at the Seattle Fur Exchange auction for an average of \$515 each with a top price of \$690 (Seattle Fur Exchange 1987). For this reason and because lynx were no longer widely used in local clothing, Kotzebue residents often sold any lynx they caught. In 1986-87, the lynx population in the Kotzebue area was very low to the point that department staff and local trappers jointly proposed a temporary reduction in the lynx bag limit and season. The most recent peak in the lynx population in the Kotzebue Sound region was in the 1981-82 season.

Because lynx are curious by nature, traps were an effective and widely used method for catching these animals. Snares were also used. Because of their solitary, shy, and nocturnal habits, lynx were seldom seen by humans and were less frequently shot or pursued by snowmachine than animals such as fox, wolf, and wolverine. Lynx meat was eaten by some households.

Expanded survey results showed that Kotzebue residents harvested an estimated three lynx in 1986, all of which were sold (Table 14). Of the 90 sampled households, one harvested a lynx; because in this case the meat was not used for food, edible poundage for lynx was not included in Kotzebue's total harvest. Only a very small number (0.4 percent) of Kotzebue households harvested lynx during the study year (Table 9). No households in the sample reported giving or receiving lynx. As with most furbearers, the harvest and use of lynx by Kotzebue residents could be expected to increase and decline in concert with the lynx population and the price of furs. The harvest data from the study year cannot be applied with any certainty to other years for which data were not gathered.

Muskrat

The muskrat is a small, aquatic fur animal that inhabits sloughs, river deltas, and marshy areas where it feeds primarily on vegetation. In the Kotzebue area, muskrats were found in greatest densities on the Kobuk River delta, the Noatak River flats, and the Selawik River flats. They were primarily sought during spring breakup when hunters shot them with .22-caliber rifles. Muskrat fur was used for parka linings, caps, mittens, clothing trim, and elaborate parkas used on special occasions. The meat was eaten, prepared by half-drying, boiling, or roasting, or fed to dogs.

Muskrat hunting was no longer a widespread spring activity among Kotzebue households in 1986. Muskrats were not available in great numbers in the immediate Kotzebue area and breakup made surface travel to muskrat hunting areas difficult in late spring (May-June). In addition, at this time of year many Kotzebue families turn their attention to spring seal hunting instead. Consequently those Kotzebue residents who hunted spring muskrat usually had camps, or friends or relatives with camps, on the Kobuk River delta, Noatak River flats, or Selawik River flats.

Expanded survey results showed that Kotzebue households took an estimated 1,568 muskrat in 1986 for an edible weight of 2,822 pounds (Table 9). This was an average household harvest of 3.7 pounds (about two muskrats) and an average per capita harvest of 1.1 pound. Muskrat accounted for 77.5 percent of Kotzebue's edible small game and furbearer harvest, but only 0.3 percent of Kotzebue's total edible harvest (Table 11).

The harvests of the sampled households ranged from 0 to 200 muskrats. None of these were sold. Kotzebue households generally used the muskrats they harvested or exchanged them with other households; occasionally Kotzebue residents purchased raw muskrat skins from residents of Noorvik. Because of the low market value for muskrat skins (about \$3 to \$7 each in 1986), there was little incentive for commercial sale of the fur. In addition, home-tanned muskrat skins were preferred by local seamstresses for making parkas because these maintained their natural colors

better than those commercially tanned. Elaborate parkas used on special occasions, locally known as "fancy parkas," were a primary use of muskrat skins in the Kotzebue region.

Musk rats were harvested by 6.3 percent of Kotzebue households (Table 9). Musk rats were not extensively exchanged; 1.5 percent of households were given muskrat while 4.1 percent gave some away. Among the households in the sample, some hunted muskrat for the meat and gave away the skins, while others hunted for the skins and gave away the meat. A total of 7.8 percent of Kotzebue households used muskrat in 1986.

Marten

Marten were a very minor resource in the harvest activities of Kotzebue residents because they were not common in the areas where Kotzebue residents predominantly traveled. Marten were primarily an animal of Alaska's interior spruce forests and their preferred habitat -- heavy timber -- was not widespread in northwest Alaska. In the Kotzebue Sound region, the furthest west that marten were found in the mid-1980s was in the Squirrel River drainage near Kiana, but even there and further inland along the Kobuk River marten were not abundant. Kotzebue residents occasionally used marten skins for caps but these were often obtained through trade with upper Kobuk River and Koyukuk River communities.

Expanded survey results showed that Kotzebue residents harvested an estimated 43 marten in 1986, 25 of which (58.1 percent) were sold (Table 14). A very small proportion (0.4 percent) of Kotzebue households harvested marten; 1.1 percent of households used marten skins. Of the 90 sampled households, one reported a catch of 14 marten. This household had a camp in the upper Kobuk River valley and spent part of the winter trapping there. It was likely that other Kotzebue households harvesting marten similarly had kinship or other personal ties to productive marten areas. Kotzebue's marten harvest was perhaps a good example of the diversity of harvest patterns found in a heterogeneous regional center.

Mink

A member of the weasel family, mink are most commonly found near streams, ponds, and marshes. Although found throughout northwest Alaska, they are not numerous in exposed coastal areas. Like many furbearers, mink are secretive and solitary. Because of this, hunters seldom saw them and the opportunistic take by winter and spring travelers was small. Trapping was essentially the only way to catch mink in quantity, but this was hard and skillful work. Few Kotzebue residents found it worthwhile to trap seriously for small furbearers because they were neither abundant nor in high demand. In early 1987, mink prices ranged from \$9 to \$62 on the international fur market with most prices between \$20 and \$40.

None of the sampled households harvested or used mink in 1986. Other Kotzebue households might have caught or used mink during the study year, but these were few enough in number to be missed by the sample. A few Kotzebue households (2.1 percent) said they attempted to harvest mink, but none were successful (Table 9).

Land Otter

The land otter is a playful and intelligent amphibious member of the weasel family that eats a variety of food from the land and the water. Otters were found in low to moderate numbers along streams and rivers in Kotzebue Sound in 1986. Kotzebue residents generally made no great efforts to catch them in part because they were difficult to trap and to skin. Occasionally local hunters shot otters opportunistically in spring when there was open water along streams and lakes. Otters' short, thick fur was desirable for boot and parka trim and sometimes used for making caps. Because the harvest was small, they were rarely sold, but instead used locally in the region.

Expanded survey results showed an estimated harvest of six otters by Kotzebue residents in 1986, none of which were sold (Table 14). None of the sampled households reported using meat

from otter harvests. Very few Kotzebue households (0.8 percent) harvested otter (Table 9). A total of 1.6 percent of households used otter during the study year.

Arctic Ground Squirrel

Arctic ground squirrels typically live in sandy or gravelly areas where the ground is dry and they can excavate burrows. They hibernate in underground dens from early October until late April or early May. When they first emerge in spring, they stay close to their dens, then wander farther after new vegetation appears. In the Kotzebue area, ground squirrels are found in greatest abundance along the beaches of the *Sisualik* and Cape Krusenstern coast. When fat, the meat of ground squirrels is eaten. The skins make durable parka linings which are still fairly common in Kotzebue. Ground squirrels are usually caught in small traps in spring and fall.

In the mid-1980s, ground squirrels were not widely harvested by Kotzebue residents except possibly by those with seasonal or permanent camps along the shores of northern Kotzebue Sound. These camp residents had the best access to ground squirrel populations. None of the sampled households harvested or used ground squirrels in 1986, although an estimated 0.7 percent of Kotzebue households attempted to harvest them (Table 9). In all likelihood, some Kotzebue households did harvest ground squirrels in 1986, but this was uncommon enough to be missed by the sample.

Weasel

The weasel, or ermine, is a small carnivore that feeds primarily on mice, often storing food when abundant. Its coat turns brown in summer and white in winter. Weasels live in a wide variety of habitats including forest, brush, and tundra. Because they are small and not economically significant, weasels were rarely the target of trapping except by children. They

were most often caught when bothersome around camps or caches or incidentally in traps set for other furbearers. Their white winter fur was sometimes used as trim for clothing.

The expanded harvest for Kotzebue showed that an estimated 26 weasels were caught in 1986, none of which were sold (Table 14). A small number of Kotzebue households (3.1 percent) harvested weasels; the same percent used weasels. No sampled households reported receiving weasel while 2.2 percent of households gave weasel away (Table 9).

Wolf

The wolf shares with the wolverine the distinction of being the most sought after furbearer in northwest Alaska. Wolves are known for their resourcefulness, intelligence, and speed, their well-developed social order, and their ability to travel great distances. In northwest Alaska, their diet consists primarily of moose and caribou supplemented by a variety of small mammals.

Many stories surround the wolf in both Euro-American and Iñupiaq history and folklore, most of which portray the wolf as dangerous. If wolves form a circle around a person, traditional Iñupiaq hunters advise shooting the farthest wolf because the other wolves will go to the injured one, leaving the person unharmed. In addition, the farthest wolf is likely the leader. Traditional hunters also used a *yūgyuaḡun* (called a bull-roarer in the literature), a thin piece of wood with a hole and a string attached, to drive wolves away. The *yūgyuaḡun* was swung in a circle over the hunter's head and produced a humming sound that frightened wolves. Hunters stranded in the country with broken snowmachines sometimes dug snow shelters to protect themselves from wolves.

Wolves were a prestigious catch for Kotzebue hunters and were nearly always taken when the opportunity arose. In the Kotzebue area, wolves were usually shot with rifles and rarely trapped. The open terrain made it possible for hunters to see long distances and to pursue wolves or follow fresh tracks at high speed on a snowmachine. Wolves were also hunted in a "land-and-shoot" manner in remote parts of the region by a few airplane-equipped Kotzebue

residents. Wolf pelts had considerable cash value, bringing \$150 to \$250 on the commercial market in 1986. Kotzebue residents, however, seldom sold wolf pelts on the commercial market, but instead used them at home or sold them directly to local residents from whom hunters could often obtain even higher prices. Wolf pelts were highly desirable as parka ruffs and, along with wolverine, were the only furs commonly used as ruffs by adults in Kotzebue. In Kotzebue stores, wolf ruffs sold for \$200 to \$250 in 1986. Some Kotzebue women sewed ruffs from wolf skins and sold these locally, significantly increasing the income from the skin. Wolf fur was also used for skin boots, mittens, Eskimo masks, and dolls.

In most of the Kotzebue Sound region, wolf populations were at medium levels and increasing in 1986. Expanded survey results showed that an estimated 22 wolves were harvested by Kotzebue residents during the study year (Table 9). The 90 sampled households harvested two wolves, neither of which were sold (Table 14). Wolves were taken by 2.9 percent of Kotzebue households; 9.5 percent of households said they tried to harvest wolves, which generally meant they would have taken wolves had they seen any. "You would be crazy not to," said one interviewed man.

A fair amount of sharing and exchange of wolf pelts occurred. In Kotzebue, 10.6 percent of households received wolf skins or portions of skins from other households, while no households in the sample said they gave wolf skins away. One interviewed woman received a wolf ruff in exchange for cutting up a wolf skin for a hunter in camp. The meat of wolves was not eaten by Kotzebue residents. A total of 13.5 percent of Kotzebue households used wolf skins in 1986.

Wolverine

Wolverine are solitary animals that range great distances in search of food. They are primarily scavengers, but also kill and eat large and small mammals and birds. Wolverine fur was prized by Kotzebue residents as parka ruffs, particularly for women, because the fur was beautiful and durable and the long, coarse guard hairs allowed frost to fall away easily. Local

residents preferred dark wolverine with a contrasting pale stripe. Wolverine fur was also used for parka trim, skin boots, Eskimo dolls, and masks.

Wolverine were present in moderate numbers in the Kotzebue Sound region in 1986. Kotzebue hunters trapped wolverine in leg-hold and conibear traps, sometimes setting them near moose or caribou carcasses. However, perhaps as many, if not more, wolverine were shot with rifles when seen by hunters in winter. Local residents sometimes followed fresh tracks with a snowmachine until they overtook the animal. Wolverine were valuable on the commercial market, bringing \$150 to \$300 in 1986. However, like wolf, they were more valuable locally where a high demand boosted the price considerably. One local trapper told researchers a Kotzebue resident paid him \$500 for an unskinned wolverine still frozen in the trap.

According to the expanded survey results, an estimated 20 wolverine were harvested by Kotzebue residents in 1986 (Table 9). The 90 sampled households caught two wolverine, neither of which were sold. Wolverine were harvested by 2.6 percent of Kotzebue households; 8.8 percent of households said they attempted to harvest wolverine by either setting traps for them or watching for them while traveling in winter. Few Kotzebue residents would forego the opportunity to shoot a wolverine.

Wolverine, along with beaver and wolf, were among the most frequently exchanged furs; 9.5 percent of Kotzebue households received wolverine skins or portions of skins and 2.2 percent gave skins away (Table 9). As an example of the latter, one interviewed household shot a wolverine while traveling in the Noatak area and gave the animal to the Noatak family with whom he was staying. A total of 12.2 percent of Kotzebue households used wolverine in 1986, the third most commonly used fur that year after red fox and wolf. Kotzebue residents' harvest of wolverine undoubtedly varied from year to year in response to wolverine abundance since local demand for the animals remained consistently high. Therefore, harvest estimates from 1986 cannot be applied with confidence to other years when wolverine abundance might be different.

BIRD HUNTING AND EGG GATHERING

Ducks, geese, and ptarmigan comprised the major avian resources harvested by Kotzebue residents in the mid-1980s. Although not contributing much (1.6 percent) to Kotzebue's total harvest in terms of weight, birds and eggs were nonetheless one of the most widely harvested resource categories in Kotzebue in 1986 (Figs. 18 and 19). More than one-half (51.1 percent) of Kotzebue households successfully harvested birds and eggs; only fish and berries and plants were harvested by a great percentage of households.

Of the bird and egg harvest, ducks and geese accounted for the largest proportions by weight, 40.1 percent and 39.2 percent respectively. Ptarmigan accounted for 12.4 percent of the bird and egg harvest, eggs accounted for 7.2 percent, and other birds accounted for 1.1 percent (Table 11). Information on the harvest and use of eggs and major bird resources is presented below. Researchers did not collect harvest information for ducks and geese on a species level. Appendix 5 lists the scientific and Inupiaq names of the resources.

Ducks

In late April, Kotzebue residents eagerly awaited the arrival of the first ducks on their annual northward migration in spring. In Inupiaq, the month of April is called *Tijmirrat Tatqiat* meaning "the month of ducks." Accounts of duck sightings were quickly passed among local residents in casual conversations on the trail, in the post office, or elsewhere in town. The spring waterfowl migrations were truly spectacular in the arctic; the skies literally came alive after the near emptiness and silence of the long winter. In spring many mouths watered at the thought of fresh duck soup.

Traditionally most duck hunting by Kotzebue area residents took place in spring and this was still true in the 1980s. It was almost impossible to imagine Kotzebue subsistence hunters foregoing this fresh source of tasty meat, even though spring waterfowl harvests remained illegal.

To a more limited extent, duck hunting took place in fall, but there was only a short period of time after the legal season opened -- usually less than two weeks -- that ducks were still found in any abundance in the Kotzebue area. Fall was also colder, wetter, and darker in comparison to spring whose long, mild dusks were ideal for hunting waterfowl. In addition, most Kotzebue residents were busy with caribou and moose hunting in September and hunted ducks only incidentally. In 1986, ducks were no longer commonly hunted during the summer molting season, although some were perhaps taken for a fresh meal from time to time. In summer many Kotzebue residents were involved in commercial fishing or other wage employment and had less opportunity for waterfowl hunting.

A variety of ducks pass through the Kotzebue area on their migrations. One of the most abundant and preferred was the northern pintail which arrived early in the year and nested in the region. Other species regularly used to varying extents were wigeon, green-winged teal, mallard, oldsquaw, shoveler, greater scaup, common eider, and black scoter (Uhl and Uhl 1977:170-172). Less common species were also occasionally utilized. Almost any kind of duck was hunted and used depending on availability, season, and need.

In the 1980s, ducks were hunted with shotguns, usually 12-gauge. Common duck hunting areas around Kotzebue included the Noatak River mouth, the *Sisualik*-Cape Krusenstern area, the camps along "Kobuk Lake," "Lockhardt Point," and lakes on the Baldwin Peninsula. Local people generally did not travel long distances for the specific purpose of waterfowl hunting. Some ducks were taken in May near leads before breakup or in June from boats while seal hunting. Hunters also built duck blinds with grass or willows at strategic sites. Depending on the season, access to waterfowl hunting areas was by foot, boat, snowmachine, or all-terrain vehicle. In fall, a few Kotzebue residents used airplanes to fly to good duck hunting locations.

Expanded survey results showed that Kotzebue residents caught an estimated 4,626 ducks in 1986 for an edible weight of 6,939 pounds or about 0.7 percent of Kotzebue's total harvest (Tables 9 and 11). The average household harvest was 9.1 pounds (about six ducks) and the average per capita harvest was 2.6 pounds (about two ducks). Ducks were the fifth most widely

harvested resource following berries, salmon, caribou, and sheefish; 37.8 percent of Kotzebue households harvested ducks during the study year (Table 9). Among the sampled households that took ducks, harvests were mostly between 2 and 20 ducks, although a few households took 25 to 120 ducks. Almost one-half (49.6 percent) of Kotzebue households used ducks in 1986. Ducks were given away by 18.8 percent of households and received by 13.9 percent.

Geese

The arrival of geese in late April or early May is a welcome sight and sound for northern Alaskans. The birds are among the first waterfowl to arrive in the Kotzebue area and are often first heard, then seen, as residents work outdoors or sit fishing at ice holes. The importance of this eagerly awaited and much discussed event might be difficult to comprehend if one has not endured a long arctic winter and experienced the resurgence of life with the arrival of spring.

Several species of geese pass through or nest in the Kotzebue area. During the study period, white-fronted geese and Canada geese were plentiful and the preferred species; these were hunted in both spring and fall. Snow geese migrated through the area in spring and were hunted at that time, but nested at points further north. Brant were also hunted in spring. Hunting techniques for geese were similar to those described for ducks. Geese were usually made into soup or boiled. With freezers available in 1986, geese were sometimes stored for future use.

Expanded survey results showed that an estimated 1,617 geese were harvested by Kotzebue residents in 1986 (Table 9). This yielded an edible weight of 6,790 pounds, very similar to the duck harvest. The average household harvest of geese was 8.9 pounds (about two geese) and the average per capita harvest was 2.5 pounds. The contribution of geese to Kotzebue's overall harvest by weight was quite small (0.6 percent) (Table 11). Geese were one of the more widely harvested resources in Kotzebue with 31.0 percent of households taking them. A total of 42.3 percent of Kotzebue households used geese during the study year.

Ptarmigan

Ptarmigan are close relatives of the grouse, inhabiting mostly treeless areas along the coast and in the mountains. They are one of the few resident birds of northwest Alaska. During the study period, the most common ptarmigan in the Kotzebue area was the willow ptarmigan which could often be seen in spring in large flocks of several hundred. Ptarmigan could be found almost anywhere, but were most abundant near willow thickets, their major winter food source.

Kotzebue residents primarily hunted ptarmigan with shotguns or .22-caliber rifles during months of snow cover (October to May). A few people hunted them in August and September. Local residents also occasionally used snares along rivers or sloughs where ptarmigan sign was evident. Ptarmigan hunting was often an activity for youngsters that taught them to hunt and to handle guns properly. For adults, ptarmigan hunting was often incidental to other hunting activities or to traveling, although local residents also occasionally went hunting specifically for ptarmigan. Ptarmigan were also targeted in winters when other fresh meat was not available. In some years, ptarmigan were abundant and encountered constantly, while in other years they were scarce. Ptarmigan were typically boiled or made into a flour-based soup.

Ptarmigan were a commonly used resource in Kotzebue although their small size precluded them from contributing a substantial portion to the local diet in terms of pounds (Table 11). In 1986, 31.8 percent of Kotzebue households harvested an estimated total of 3,053 ptarmigan (Table 9). Ptarmigan contributed 2,137 edible pounds to Kotzebue's overall harvest, or an average of 2.8 pounds (about four birds) per household or 0.8 pound (about one bird) per person. Of the sampled households, harvests ranged from 0 to 60 birds. Local ptarmigan populations were moderate and increasing in 1986. Forty-one percent of Kotzebue households used ptarmigan during the study year, making it the third most frequently used bird after ducks and geese.

Spruce Grouse

Spruce grouse inhabit timbered areas of spruce and birch and consequently were not found in the tundra areas near Kotzebue. However, Kotzebue residents who traveled in fall in forested portions of the Noatak and Kobuk River drainages occasionally took grouse when they came across them. Grouse were usually shot with a .22-caliber rifle or shotgun.

As a result of its geographic distribution, grouse was among the least used resources in Kotzebue in 1986. Expanded survey results showed an estimated harvest of 43 grouse by Kotzebue households for an edible weight of 30 pounds (Table 9). The average household harvest was less than 0.1 pound. Grouse were harvested and used by 1.9 percent of households; they were rarely exchanged with 1.1 percent of households giving grouse away and no households in the sample receiving any. Of the 90 sampled households, three took grouse with harvests ranging from one to five. It is unlikely that grouse were ever taken in large numbers by Kotzebue residents because of the bird's limited habitat in nearby areas.

Sandhill Crane

The sandhill crane with its long legs and distinctive cry is one of the first waterfowl species to arrive in northwest Alaska in spring. Most cranes harvested by Kotzebue residents were taken opportunistically at this time of year (late April and May). They are wary birds, difficult to approach on the ground, and not easy to catch. In fall, the large flocks of cranes migrating south usually flew very high and were unavailable to Kotzebue area residents.

Cranes were not harvested in large numbers by Kotzebue residents. Expanded survey results showed an estimated Kotzebue harvest of 17 cranes in 1986 for an edible weight of 139 pounds (Table 9). This was an average of about 0.2 pound per household. Cranes were harvested and used by 1.5 percent of Kotzebue households. No households in the sample received or gave away crane, probably due to the infrequency with which these birds were harvested.

Snowy Owl

A large, white bird of treeless terrain, the snowy owl is one of the few birds found year-round in the coastal regions of northwest Alaska. Snowy owls migrating southward along the beaches in October and November were sometimes caught by local residents in small traps set on poles (Uhl and Uhl 1977:81). This occurred more often in the Kivalina area to the northwest of Kotzebue and in camps on the north side of Kotzebue Sound than in the Kotzebue vicinity where owls were less common. Snowy owls were usually cooked in soup.

Snowy owls comprised a very small portion of Kotzebue's harvest in 1986. Expanded survey results showed that an estimated five owls were taken by Kotzebue residents for an edible weight of 15 pounds (Table 9). Less than one percent of households took snowy owls and no households in the sample exchanged this resource. The one sampled household who took a snowy owl had a camp in the Cape Krusenstern area and likely caught the bird there.

Swans and Other Birds

Large, V-shaped flocks of tundra swans are a familiar sight and sound in the Kotzebue area in early spring (late April and early May). Although taken by Kotzebue residents, swans were not harvested in great numbers. Elderly residents especially enjoyed the young, gray swans of fall and hunters sometimes killed these to give to elderly people. Researchers, however, did not collect harvest data for swans because there was no open season for them in GMU 23 and community leaders felt that hunters would be reluctant to report their kills, resulting in unreliable data.

Kotzebue residents also at times used a variety of other birds, but not to an extent that warranted their inclusion on a household survey. Uhl and Uhl (1977:75-82) documented use of loons, murre, glaucous gulls, whimbrel, gyrfalcon, and peregrine falcon as food by residents and travelers in the Cape Krusenstern area. These were usually caught in small numbers by

campers and travelers looking for a fresh meal or for variety in their diet. Almost any bird available would be used in times of emergency food shortages.

Eggs

Each year, the spring bird migrations to northwest Alaska provide Kotzebue residents not only with fresh meat but also with fresh eggs. Egg gathering started in late May and continued until early July depending on the species. Egging took place most frequently in the *Sisualik*-Cape Krusenstern area where glaucous gull eggs comprised the major component of the harvest. Eggs of other birds such as terns, loons, jaegers, owls, sandpipers, and a variety of ducks and geese were also used when found, but these were not available in as large of concentrations (Uhl and Uhl 1977:169-172). Egg gathering of this type was often an activity for children and young women and simply required walking and looking for eggs along beaches, lakes, or in other likely places.

Murre eggs were also gathered by Kotzebue residents, but these required a different harvest technique. Murres nested in large colonies on cliffs and egg gatherers had to be skilled climbers to reach the nests. The gatherer, usually a man, typically wore a hooded parka with a drawstring bottom in which to carry the eggs. The nearest murre colony to Kotzebue was at Chamisso Island, about 60 miles south of Kotzebue. Some families took annual trips by boat to Chamisso Island in early July to collect eggs. Murre colonies were also found at Cape Thompson between Kivalina and Point Hope, but this was about 125 miles from Kotzebue and residents did not usually travel this far by boat. However, Kotzebue residents visiting in Kivalina or Point Hope sometimes accompanied friends or family on egging trips to Cape Thompson.

Expanded survey results showed that in 1986 Kotzebue residents gathered an estimated 6,577 eggs for an edible weight of 1,250 pounds (Table 9). This was an average household harvest of 1.6 pounds (about eight eggs). The contribution of eggs to Kotzebue's total harvest by weight was very small (0.1 percent) (Table 11). Eggs were gathered by 8.2 percent of Kotzebue

households and used by 15.9 percent of households. Of the sampled households that gathered eggs, most harvests ranged from 2 to 60 eggs although one household gathered 960 eggs at Cape Thompson while visiting Point Hope. Egg harvests by Kotzebue residents likely varied from year to year depending on bird populations, weather, and human demand.

FISHING

The major fish resources available to Kotzebue residents in the 1980s were chum salmon, sheefish, Dolly Varden, saffron cod, northern pike, burbot, arctic grayling, Pacific herring, and several species of whitefish. Less widely used or available fish resources included four other salmon species, rainbow smelt, arctic cod, starry and arctic flounder, longnose sucker, slimy and fourhorn sculpin, nine-spine stickleback, and Alaska blackfish. Appendix 5 lists the scientific and Inupiaq names of these resources. Shellfish, including clams, mussels, and crab, were not widely available in the Kotzebue area although some households did harvest or use them. Information on the harvest and use of specific fish resources is presented below.

In 1986, fish accounted for the greatest proportion (40.6 percent) of Kotzebue's harvest by weight of any major resource category (Fig. 19). Together salmon and sheefish accounted for 75.5 percent of Kotzebue's fish harvest and 30.6 percent of Kotzebue's total wild food harvest (Table 11). More households (75.1 percent) participated in fishing than in any other resource harvest activity; 95.1 percent of households used fish during the study year (Table 9). Information on the use of fish for dog food appears earlier in this chapter.

Fishing of one kind or another occurred nearly year-round in Kotzebue. Unlike big game hunting, fishing often took place in the immediate Kotzebue vicinity with other common fishing sites located in "Kobuk Lake" (Hotham Inlet) and the *Sisualik*-Cape Krusenstern area. In the Kotzebue area in 1986, subsistence fishing regulations (including gear other than rod-and-reel) established no catch limits, no closed seasons, and no permits for any species. Rod-and-reel

fishing was defined in regulation as sport fishing and subject to state regulations specifying seasons, catch limits, and a sport fishing license.

Salmon

Kotzebue Sound was the northernmost area in Alaska with large concentrations of salmon. It also had the northernmost commercial salmon fishery, as described in Chapter 3. The Kotzebue Sound runs were overwhelmingly composed of chum salmon with small numbers of chinook, sockeye, pink, and coho salmon also present. The majority of salmon in Kotzebue Sound were bound for the Kobuk and Noatak rivers. Lower Kobuk River salmon arrived in Kotzebue Sound first, peaking in the local fishery in mid- to late July. Noatak River salmon, which were more abundant than the Kobuk River run, peaked in early to mid-August (Merkouris and Lean 1988:56).

Kotzebue residents typically used set gill nets ranging from 20 to 300 feet in length to catch salmon for subsistence use. Nets were usually set relatively close to town or to camp, so that fishermen could check their nets with ease. *Sisualik, Iluviaq*, "Sadie Creek," the Noatak River mouth, and Kotzebue beaches were popular salmon fishing locations. Local residents began setting nets for salmon in late June or early July and fished until late August.

Subsistence salmon fishing in the Kotzebue area was relatively free of regulation. In 1986, Kotzebue subsistence fishermen could fish for salmon at any time and in any location as long as their net did not obstruct more than one-half the width of any fish stream. Nets could not exceed 50 fathoms (300 feet) in length. There were no limits on the number of fish caught and no permits were required. Commercial fishermen were not allowed to fish for subsistence purposes during the closed periods of the commercial fishery. Many commercial fishermen, however, obtained salmon for home use by removing them from their commercial catches. Fishing for salmon with rod and reel rarely occurred in the Kotzebue area, although at times people might catch salmon incidental to rod-and-reel fishing for other species.

Kotzebue residents preserved and prepared salmon in a variety of ways. In July, partially dried, cooked salmon was a preferred food. Fresh salmon was baked or roasted. When caught in large quantities, salmon were gutted and filleted with an *ulu* (woman's knife) and hung on fish racks to be dried or half-dried for food or dog food. Half-dried salmon were placed in plastic "ziplock" bags and stored in freezers for later use. Kotzebue residents enjoyed the variety in their winter diet that stored salmon provided.

Salmon were also preserved by salting and pickling. To prepare salmon this way, fresh fish were gutted, the gills removed, and the heads cleaned. The salmon were filleted into one piece called the "belly" part. The "belly" part and the salmon heads were laid in a barrel with rock salt sprinkled between the layers. The barrel was placed in a cool place. As it sat, water drained from the salmon and collected in the barrel. This brine covered the fish and preserved it. Salted salmon had to be soaked in water for up to two days before being eaten. This salted salmon, called *tagiitchiaq*, was considered excellent eating by most Kotzebue residents. Desalted salmon was also pickled in jars.

While air drying was common, smoking was not a widespread salmon preservation method in Kotzebue. The small number of Kotzebue residents who smoked salmon often used it in trade or as a special treat at home. In 1986, one private business in Kotzebue commercially sold locally smoked salmon in summer. Kotzebue grocery stores also occasionally sold smoked salmon from Yukon River communities such as Ruby and Galena.

Expanded Kotzebue survey results showed that in 1986 salmon ranked third among all resources in pounds harvested, following caribou and bearded seal (Table 9). Salmon accounted for 18.4 percent of Kotzebue's total wild food harvest (Fig. 20). Only four resources (caribou, bearded seal, salmon, and sheefish) each contributed more than ten percent to Kotzebue's total harvest. Among fish resources, salmon ranked first, contributing 45.3 percent of Kotzebue's fish harvest (Table 11). Kotzebue's total 1986 salmon harvest for subsistence use was an estimated 32,128 fish or 195,981 edible pounds (Table 9). This was equivalent to an average household harvest of 256.2 pounds (42 fish) or a per capita harvest of 73.1 pounds (about 12 fish). Salmon

harvests by sampled households ranged from 0 to 2,000 fish. The subsistence harvest included both fish taken from commercial catches and fish harvested through subsistence fishing. Expanded survey results showed that 78.0 percent of commercial fishing households in Kotzebue took salmon from their commercial catches for a total of 2,729 fish, or about 24 fish per commercial fishing household. This comprised about 8.5 percent of Kotzebue's salmon harvest for subsistence use. About 9.9 percent, or 3,190 fish, of Kotzebue's non-commercial salmon catch went to dog food. Further information on the use of wild foods for dog food is presented earlier in this chapter.

More households participated in salmon fishing than in any other specific harvest activity except berry picking (Table 9). Expanded survey results showed that 49.0 percent of Kotzebue households harvested salmon in 1986. Most households that tried to harvest salmon were successful. Salmon was used by 85.4 percent of Kotzebue households; only caribou was used by a greater percentage. Salmon was also widely shared, with 43.9 percent of Kotzebue households receiving salmon and 29.9 percent giving some away.

Sheefish

The largest member of the whitefish family, sheefish in Alaska are found in the Kuskokwim, lower Yukon, Koyuk, and Kobuk-Selawik River drainages as well as in several Yukon River tributaries. Sheefish generally occupy large, slow-moving river systems. In northwest Alaska, the sheefish population is considered estuarine anadromous (Alt 1987:10). At breakup, sheefish in the Kotzebue area migrate up the Kobuk and Selawik rivers to feeding areas. Spawning fish continue further upstream to spawning grounds in the upper Kobuk and Selawik River drainages. In late summer and fall, sheefish migrate back downstream to overwintering areas on the estuaries of both rivers, in Selawik Lake and "Kobuk Lake" (Hotham Inlet), and around Kotzebue where they feed on small fish.

Harvested for food, dog food, as a trade item for other goods, and for commercial sale, sheefish comprised a major component of Kotzebue's fish harvest. These fish were a preferred food in local residents' diets and were in demand in other northwest Alaska communities where they were not locally available. Local residents primarily harvested sheefish from freeze-up until breakup with the preferred harvest methods varying with the time of year. Small sheefish were occasionally caught by Kotzebue residents in summer incidental to other fishing activities; these were immature fish that remained in the estuarine environment in small numbers during summer (Alt 1987:10).

In October or November, soon after Kotzebue Sound freezes and the coastal ice is safe for traveling by snowmachine, local residents set large-mesh nets under the ice for sheefish. These nets were often shortened sections of old salmon nets and were typically set northeast of Kotzebue near Pipe Spit. Comparatively few Kotzebue residents fished in this manner as it required a high level of skill and daily tending during a time of year when the days were short and cold. Due to tides, currents, and rapidly thickening ice, nets easily froze into the ice if fishermen were not cautious or the net was inadequately tended. This led to a permanent loss of the net and the fish it had caught. Year-round camp residents along "Kobuk Lake" set sheefish nets near their camps from freeze-up until March. A few Kotzebue residents participated in the small commercial sheefish fishery described in Chapter 3.

With the longer days of March, Kotzebue residents began to jig, or hook, for sheefish through the ice. Residents traveled by snowmachine to known fishing areas on "Kobuk Lake" such as "Nelson's Camp," *Qiruuruaq*, "Theodore Creek," *Ivik*, and Pipe Spit, most of which were 30 minutes to two hours by snowmachine from Kotzebue. Many spent the whole day traveling and fishing, while others camped on "Kobuk Lake" for the weekend to fish. Kotzebue residents without snowmachines used all-terrain vehicles to reach fishing areas nearer to Kotzebue if snow conditions permitted. Local residents searched for places where sheefish were biting, and regularly moved from one spot to another until a school of fish was located. Pressure ridges on the lake were often good fishing locations because the ice there was not as thick as in other areas.

On a Saturday afternoon in spring, it was not uncommon to find groups of 20 to 50 people scattered around "Kobuk Lake" in good sheefish fishing areas.

Some Kotzebue families had gasoline-powered ice augers and drilled holes in the ice for fishing. Those without augers found holes already made or made holes by hand with a *tuuq*, a long, homemade pole with a sharpened iron tip. Experienced individuals using a *tuuq* could chop holes through four-foot thick ice with remarkable speed. Local residents stated that no ownership rights were associated with ice holes, and anyone was free to fish in a hole not in use at the time.

Kotzebue residents used handmade, curved jigging sticks to catch sheefish through the ice. A sturdy woven or monofilament nylon line was attached to the jigging stick and a large spoon with treble hook was tied to the line's other end. Herring were initially used as bait, but once a sheefish was caught a small piece of skin was cut from its chin for bait. Because sheefish traveled in schools, experienced fishermen noticed which direction the sheefish were traveling when caught, and then moved in that direction to find new fishing holes after the school had passed. Hooking for sheefish was one of Kotzebue residents' favorite spring harvest activities. It was also an effective method for harvesting sheefish. Skilled fishermen could harvest a sled load of fish in a day of hooking.

Kotzebue residents hooked for sheefish until the coastal ice was no longer safe for traveling. In April and May when the warm midday sun created pools of water on the ice, Kotzebue residents traveled to fishing areas very early in the morning and very late at night when the standing water was frozen in the cool air. In May when the coastal ice was breaking up, Kotzebue residents continued to hook for sheefish on remnants of stable ice adjacent to town.

As the ice ran from "Kobuk Lake" in late spring, Kotzebue residents began using rods and reels to harvest small, young sheefish (*mayauyuk*) along the beaches of Kotzebue. Small sheefish were also occasionally caught in salmon nets in summer. Sheefish flesh tended to be mushy in summer and not considered as desirable as in winter.

Sheefish were prepared for eating in a variety of ways. They were boiled, roasted, and made into a flour-based soup. Iñupiaq families customarily ate frozen sheefish (*quaq*)

accompanied with seal oil (*uqsruq*). During winter, sheefish were kept frozen outside until ready to be prepared or served. Sheefish caught in large quantities in May were typically cut and hung to dry in the outside air.

Residents of communities where sheefish were not available such as Noatak, Kivalina, Point Hope, and the Seward Peninsula were always delighted to receive sheefish from Kotzebue. Sheefish were sold to these communities as well as shared or bartered for items such as gasoline, groceries, crab, or other wild foods.

Sheefish was one of four resources that in combination accounted for 74.0 percent of Kotzebue's mean household harvest in 1986 (Fig. 20). It ranked fourth in terms of total pounds harvested, following caribou, bearded seal, and salmon. Expanded survey results showed that an estimated 23,742 sheefish were harvested in 1986 for a total edible weight of 130,580 pounds (Table 9). This was equivalent to an average household harvest of 170.7 pounds (31 fish) or an average per capita harvest of 48.7 pounds (nine fish). Sheefish harvests of sampled households ranged from 0 to 1,500 fish.

Sheefish fishing was one of the most widely engaged in harvest activities of Kotzebue households. Expanded survey results indicated that 42.5 percent of Kotzebue households harvested sheefish in 1986; only berries, salmon, and caribou were harvested by more households (Table 9). More than three-quarters (76.0 percent) of Kotzebue households used sheefish. Sheefish was also one of the most widely exchanged resources with one-half (50.2 percent) of Kotzebue households receiving sheefish and one-third (33.4 percent) giving some away.

Dolly Varden

In the Kotzebue Sound region, Dolly Varden were locally known as "trout." Taxonomically there has been some uncertainty as to whether northwest Alaska Dolly Varden were the western form of the Arctic char or the northern form of the Dolly Varden (DeCicco 1985:50). Most scientists, however, now believe that the latter is the case (Merkouris and Lean 1988:147). In

Kotzebue Sound, the Noatak, Kivalina, and Wulik rivers support major Dolly Varden populations. These fish were widely regarded as a choice food by Kotzebue residents. They were harvested primarily for direct consumption, but were also bartered, shared, and sold in small quantities to fish buyers during the commercial salmon season.

Dolly Varden in northwest Alaska were an anadromous fish, overwintering in fresh water and spending the summers feeding at sea. They migrated seaward in spring, moving from streams into the ocean when the rivers broke up, the sea ice retreated offshore, and the water along the coast was open. In the Kotzebue area, this usually occurred in late May or early June. Spawning took place predominantly in summer; summer spawners remained in fresh water during the year of spawning. Some Dolly Varden spawned in fall. The fall migration of Dolly Varden from the sea back into fresh water occurred between mid-August and late September (DeCicco 1985:41-67).

Kotzebue residents harvested Dolly Varden in June, August, and September as the fish passed by local beaches on their seaward, spawning, and overwintering migrations. In June, fish migrating westward from the Noatak River were caught by Kotzebue residents in coastal camps near Cape Krusenstern and *Sisualik*. These camps were seasonally occupied primarily for marine mammal hunting, but campers also set nets on the beaches for Dolly Varden and whitefish species. Dolly Varden taken at these camps were eaten fresh or cut into strips to be dried. Being lean at this time of year, they were considered good for making dried fish preserved in seal oil (*puuġmiutaq*). Dolly Varden also traveled southward from the Noatak River in spring and were caught in smaller numbers at "Sadie Creek" and in other areas in the Kotzebue vicinity.

In late summer, Dolly Varden migrating to the Noatak River were incidentally caught in commercial salmon nets in the Kotzebue vicinity. This catch usually peaked during the third or fourth week of August (DeCicco 1985:67). Fishermen frequently kept the Dolly Varden from their commercial catches for their personal use during winter; these fish were often stored in home freezers. Dolly Varden were also sold to commercial fish buyers, but in some years a market was not available and buyers were not interested in purchasing them. In 1986, the Dolly

Varden market was very limited and only five of the estimated 2,373 incidentally caught were sold. In 1987, 1,261 Dolly Varden were sold at an average price of \$.30 per pound (Merkouris and Lean 1988:147-151). Table 15 summarizes the incidental harvest of Dolly Varden by the Kotzebue commercial salmon fishery from 1978-1986.

Some Kotzebue residents relied on friends and relatives in Kivalina and Noatak for Dolly Varden. Residents of these communities typically harvested large numbers which they gave and sold to Kotzebue residents and others in the region. Kotzebue residents considered Kivalina and Noatak "trout" a special treat. Some Kotzebue residents traveled to Kivalina or Noatak to assist in seining Dolly Varden, thereby obtaining a share of the harvest.

Dolly Varden were also a preferred fish for rod-and-reel anglers fishing for sport. Most of this fishing occurred in airplane-accessible areas on the Noatak River and, to a lesser extent, the Wulik River. The Kelly and Kugururok rivers, tributaries of the Noatak about one hour by small airplane from Kotzebue, were the most popular areas for fly-in Dolly Varden fishing. During the long summer days, some airplane owners in Kotzebue flew to the Kelly River for the day or the weekend to fish, picnic, camp, and enjoy the outdoors. These fishermen typically harvested only small numbers of Dolly Varden due to limited space in their airplanes and a sport fishing bag limit of ten fish per day, only two of which could be over 20 inches.

In the past, Kotzebue people seined large quantities of migrating Dolly Varden along the lower Noatak River in fall. The fish were preserved by storing them in the ground with grasses and willows. First, a ditch was dug in the ground. Willows were layered on the dirt and grass, then fish were laid on the willows. The fish were covered with grass and earth. This process allowed the fish to age slightly, acquiring a preferred distinctive taste. Dolly Varden were also preserved by cutting them and hanging them to dry for about three days. This partially dried Dolly Varden was called *paniḡruktaq*.

In contemporary times, connoisseurs of *niqipiaq* (Eskimo food) still prefer Dolly Varden that were slightly aged and frozen (*quaq*). Dolly Varden were also roasted or made into a flour-based soup. Dolly Varden liver was used to make an Eskimo dessert. The liver was first

TABLE 15. INCIDENTAL DOLLY VARDEN HARVEST IN COMMERCIAL SALMON FISHERY,
KOTZEBUE DISTRICT, 1978-86.

Year	Estimated total incidental harvest ^a	Number of Dolly Varden sold	Pounds sold ^b	Average price per pound
1978	NA	1,229	9,094	0.15
1979	NA	2,523	12,523	0.25
1980	NA	3,049	17,015	0.20
1981	NA	3 ^c	16	0.17
1982	NA	3,447	23,648	0.20
1983	845	190 ^c	1,108	0.20
1984	1,090	347 ^c	2,104	0.25
1985	3,600	454	3,177	0.25
1986	2,373	5 ^c	34	0.20

Source: Merkouris and Lean 1988:151.

(a) Estimate includes fish caught but not sold based on interviews with fishermen.

(b) Some data extrapolated from average reported weight.

(c) Limited Dolly Varden market.

cleaned, boiled, and set aside to cool. It was then mashed with a little water and mixed with blackberries, also called crowberries. This dessert, called *tiqulik*, was very palatable and commonly served during fall.

Expanded Kotzebue survey results showed that Dolly Varden ranked seventh among all resources in terms of total pounds harvested in 1986, accounting for 2.3 percent of Kotzebue's overall harvest (Table 11). Among fish resources, only salmon and sheefish exceeded Dolly Varden in harvest quantities. Kotzebue households harvested an estimated 7,503 Dolly Varden in 1986 for a total of 24,759 edible pounds (Table 9). This equaled a mean harvest of 32.4 pounds (about ten fish) per household or 9.2 pounds (about three fish) per person. Although Kotzebue residents harvested these fish, some of the harvest might have occurred in Noatak or Kivalina while Kotzebue residents were visiting friends or relatives there. Dolly Varden harvests of sampled households ranged from 0 to 300 fish.

One-third (33.4 percent) of Kotzebue households harvested Dolly Varden in 1986 (Table 9). This was one of the most widely harvested resources, exceeded only by berries, salmon, caribou, sheefish, and ducks in terms of harvest participation. Dolly Varden was also widely shared: 29.3 percent of Kotzebue households received Dolly Varden and 16.3 percent gave some away. Fifty-nine percent of Kotzebue households reported using Dolly Varden during the study year. Only caribou, salmon, sheefish, and berries were used by more households.

Saffron Cod

Saffron cod, locally known as "tomcod," are saltwater fish common in the coastal regions of northwest Alaska. Like salmon, Dolly Varden, sheefish, and herring, cod are seasonally abundant in the Kotzebue area. In fall and winter, these fish move to shallow inshore water to spawn and then move offshore again in spring and summer to feed (Morrow 1980:188). Spawning takes place between December and February.

Kotzebue residents harvested tomcod intensively from October until late November with some fishing extending into December. At this time of year, tomcod were easily caught in shallow water near town. Local residents preferred to eat tomcod in fall because they were full of roe at this time. Tomcod were also taken incidentally in spring while hooking for smelt, but they were skinny at this time of year and generally not used for food except for dogs.

As soon as the lagoon behind Kotzebue froze, residents began jigging for tomcod through the ice. When the coastal ice was solid in front of Kotzebue, larger tomcod were caught there. In late October and early November, it was common to see dozens of people, old and young, sitting on buckets or folding chairs on the ice in front of town, jigging for tomcod. When tomcod are abundant, fishermen catch one after another.

Tomcod fishermen used homemade jigging sticks with a treble hook and a sinker attached to the line. Red yarn was sometimes tied to the line to attract fish, or pieces of the fleshy portion of a tomcod tail were used as bait. Ardent fishermen often made their own fish hooks and sinkers. Because tomcod fishing required a fairly long line, fishermen used a short stick to help pull up the line when a fish was caught, thereby keeping their gloves fairly dry. When tomcod were plentiful, fishermen often snagged them with a certain hand motion in jigging, as well as caught them in the mouth when the fish bit. Tomcod were generally prepared in one of two ways: either boiled whole or eaten frozen.

Tomcod fishing for subsistence purposes was unrestricted by regulations in the Kotzebue area. Fishing through the ice with a hand-held line was defined as subsistence fishing in state regulations. There were no seasons, closed areas, gear restrictions, bag limits, or reporting requirements. No permits or licenses were required.

In 1986, Kotzebue residents harvested an estimated 67,233 tomcod for an edible weight of 14,119 pounds (Table 9). This accounted for 1.3 percent of Kotzebue's total harvest and 3.3 percent of Kotzebue's fish harvest (Table 11). Among all resources, tomcod ranked thirteenth in terms of pounds harvested. The average household harvest of tomcod was 18.5 pounds (88 fish), while the average per capita harvest was 5.3 pounds (25 fish).

Tomcod fishing was a popular harvest activity for Kotzebue residents because it required little travel or equipment, could be done by all age groups, and occurred at a time of year when freeze-up limited travel and few other harvest activities were taking place. In 1986, 31.5 percent of Kotzebue households participated in tomcod fishing, almost all of whom were successful (Table 9). About 43 percent of households used tomcod. Tomcod was given away by 22.3 percent of Kotzebue households and received by 12.6 percent.

Whitefish Species

In the Kotzebue area, several species of whitefish were seasonably available, including Alaska whitefish, least cisco, Bering cisco, and broad whitefish (Uhl and Uhl 1977:10). These fish spawned in the fall in fresh water and overwintered in the brackish water of "Kobuk Lake" (Hotham Inlet) and near the mouths of the Noatak, Kobuk, and Selawik rivers. In the Kotzebue area, whitefish moved from the river mouths westward along the beach in spring. In fall, whitefish moved back towards the large river estuaries.

Kotzebue residents harvested whitefish predominantly in the spring and fall along the beach between *Sisualik* and Cape Krusenstern, in the Noatak River mouth, and near camps on "Kobuk Lake." Whitefish were not as abundant in the immediate Kotzebue vicinity, although some were caught in nets set along the beach. In fall, whitefish were full of roe and considered best for eating. At this time of year, fish were put in sacks and kept frozen in the outdoor air for use as *quaq* (frozen fish) later in winter. During spring, whitefish were lean and good for making dried fish.

In the Kotzebue area, several methods were used to harvest whitefish. One method used in spring and fall was to set 3 1/2-inch mesh nets along the beach or in the river mouths. Whitefish were also seined in fall in areas where they concentrated in large numbers. A final method, and perhaps the most efficient, was peculiar to the coast between *Sisualik* and Cape Krusenstern where natural processes seasonally created giant fish traps. During spring high water, whitefish

moved into lakes and streams along the coast to feed for the summer. Wave action and coastal currents over the course of the summer moved large quantities of beach gravel, which dammed the outlets to these streams and lakes and impounded the whitefish. With the arrival of freezing temperatures in September, local residents dug three-foot wide ditches near these gravel dams with a gradient that allowed a good outward flow, but dried up before reaching the ocean. Whitefish followed the current only to find themselves out of water, at which time fishermen picked up the fish and put them in sacks (Uhl and Uhl 1977:10-12). The main location of this whitefish harvest was *Anigaaq*, the mouth of the Krusenstern lagoon system.

Many Kotzebue residents relied on relatives in outlying camps or communities to provide them with whitefish. Dried whitefish from Selawik and other inland communities was in particularly high demand. During the survey interviews, respondents frequently commented that they did not dry whitefish themselves but purchased or received it from Selawik, which had the reputation for the best dried whitefish in the region. Besides being shared among relatives and friends, Selawik dried whitefish was sold in strings in Kotzebue grocery stores. A string of whitefish had eight fish and sold for \$11 in 1986.

Expanded survey results showed that Kotzebue residents harvested an estimated 9,594 whitefish in 1986 for an edible weight of 16,789 pounds (Table 9). This comprised 1.6 percent of Kotzebue's total harvest of wild foods (Table 11). The average household harvest was 21.9 pounds (about 12 fish) while the per capita harvest was 6.3 pounds (about four fish). Among fish resources, whitefish ranked fifth in terms of pounds harvested, comprising 3.9 percent of Kotzebue's fish harvest.

In 1986, whitefish were harvested by 21.0 percent of Kotzebue households (Table 9). Fifty-five percent of households reported using whitefish, making this one of the more widely used resources. Only caribou, salmon, berries, sheefish, and Dolly Varden were used by more households. Kotzebue residents frequently obtained whitefish from others; 38.5 percent of Kotzebue households received whitefish while only 8.9 percent gave whitefish away. Whitefish

was the sixth most widely received resource in Kotzebue, following caribou, sheefish, salmon, bowhead muktuk, and berries.

Northern Pike

The northern pike is a carnivorous freshwater fish with a circumpolar distribution. Pike overwinter in relatively deep water in lakes and rivers, moving to marsh areas in the spring to spawn (Morrow 1980:165-166).

In the Kotzebue area, pike were caught with hand lines through the ice in winter or with rods and reels in grassy waterways in summer. Popular fishing areas were in the lower Noatak River and "Kobuk Lake" (Hotham Inlet). Pike were also incidentally caught in spring while jigging through the ice for sheefish or fishing with nets for whitefish. Kotzebue residents generally preferred to eat pike dried rather than fresh. Selawik, Noorvik, and upper Kobuk River communities were known for their delicious dried pike, and Kotzebue residents with relatives in these communities often received dried pike from them. Dried pike was also sold seasonally in Kotzebue grocery stores for \$13 per string of six fish in 1986.

Expanded survey results showed that Kotzebue residents harvested an estimated 5,750 pike in 1986 for an edible weight of 18,976 pounds (Table 9). This equaled a mean household harvest of 24.8 pounds (about seven fish) and a per capita harvest of 7.1 pounds (about two fish). Pike accounted for 1.8 percent of Kotzebue's total harvest of wild food and 4.4 percent of Kotzebue's fish harvest (Table 11). Almost one-third (30.3 percent) of Kotzebue households harvested pike and 42.5 percent used pike. Pike was shared less widely than some fish resources: 16.7 percent of households received pike while 11.6 percent gave some away.

Pacific Herring

Pacific herring were similar to many other fish resources in Kotzebue Sound in that they were abundant only seasonally. Herring were available to the subsistence fisherman for only a brief period of time, making this one of the shortest harvest seasons of subsistence foods in the Kotzebue area. Herring in Kotzebue Sound were believed to be a separate stock from those found in the southern Bering Sea and exhibited significant differences in size and behavior from more southerly populations (Merkouris and Lean 1988:109-110). In 1986, there was no commercial fishery for herring in Kotzebue Sound, although local fishermen have expressed interest in developing one.

In spring, Kotzebue Sound herring spawn on aquatic detritus in local lagoons. Although spawning appears to be fairly well dispersed, local residents have observed concentrations of spawning herring in "Kobuk Lake" (Hotham Inlet) near *Ivik*, along the northern shore of Eschscholtz Bay, and near the mouth of the Kiwalik River (Moore 1980). Herring overwinter in nearshore waters around Kotzebue, attracted by the warmer water temperatures that result from the freshwater flow of the Noatak and Kobuk rivers (Mark Willette pers. comm., 1988). In summer, herring are believed to move offshore to feed.

Kotzebue residents primarily harvested herring during a brief period in late spring when large concentrations of herring were in nearshore waters and ice conditions allowed fishing. This usually occurred for a week or two in late May or early June. Local residents have observed that herring run with the ice, and thus fishermen watch the ice conditions to determine when herring fishing might begin.

Local residents most commonly harvested herring by snagging them with rods and reels. One or more three-pronged hooks and a sinker were attached to the line. The dock of the local barge company at the north end of town was the most popular location for catching herring in spring with a rod and reel. The water off the dock was deep and it was easy to cast and reel in lines from here. During the herring run, it was common to find dozens of people of all ages

fishing from the dock during the long spring days. Most caught only small quantities of herring, enough for a few meals. The nearshore water had to be relatively ice-free in order to use a rod and reel to harvest herring; winds, currents, and breaking ice in "Kobuk Lake" intermittently clogged the coastal waters with ice and made fishing impossible.

Kotzebue residents wanting to harvest a large quantity of herring used small-mesh herring nets. These were set in the lagoon or along the beach where there was current. Local residents who fished with nets often used some of their harvest for dog food and shared buckets of herring with relatives and friends.

Kotzebue residents preserved herring by salting and pickling. The herring were first scaled and gutted, then covered with rock salt and stored in containers. Women then pickled the herring using ingredients from their own recipes such as onions, cloves, and pickling spices.

In 1986, Kotzebue residents harvested an estimated 54,365 herring for an edible weight of 9,786 pounds (Table 9). This accounted for 0.9 percent of Kotzebue's total resource harvest (Table 11). The average household harvest was 12.8 pounds, or about 71 fish. The average per capita harvest was 3.7 pounds, or about 20 fish. Herring ranked eighth among fish resources in terms of pounds harvested. An estimated 29.2 percent of Kotzebue households harvested herring in 1986. Fourteen percent of households gave herring away, while 4.9 percent of households received it. Herring was used by one-third of Kotzebue households.

Arctic Grayling

The arctic grayling is a small freshwater fish common in clear, cold streams and lakes throughout Alaska. Grayling spawn in small streams in spring immediately after breakup. They spend the summer in clear pools, moving downstream in fall to overwintering areas in deep water. In northwest Alaska, grayling were found in most of the region's rivers and streams.

Kotzebue residents typically did not harvest grayling in large numbers. These fish were not readily available in the Kotzebue vicinity and were not considered as choice as salmon, Dolly

Varden, or whitefish. However, grayling were easy to catch on a hook in creeks and rivers, and were commonly harvested for meals on summer camping trips. Grayling were also incidentally caught in rivers while rod-and-reel fishing for Dolly Varden or other fish. Kotzebue residents usually ate grayling either frozen (*quaq*) or freshly cooked.

Expanded survey results showed that Kotzebue residents harvested an estimated 2,191 grayling in 1986 for an edible weight of 1,972 pounds (Table 9). The average household harvest of grayling was 2.6 pounds (about three fish) and the average per capita harvest was 0.7 pound (about one fish). Grayling accounted for 0.2 percent of Kotzebue's total harvest of wild food and 0.4 percent of Kotzebue's fish harvest (Table 11).

One-fourth of Kotzebue households harvested grayling in 1986 and 31.3 percent of households used this resource (Table 9). Grayling ranked seventh among fish resources in terms of harvest participation. Grayling was not as widely shared as many other resources perhaps because it was a small fish usually harvested in small quantities. The survey found that 6.3 percent of Kotzebue households received grayling while 4.7 percent gave some away.

Burbot

A member of the codfish family, burbot is a freshwater fish with a circumpolar distribution in the northern hemisphere. In the Kotzebue area, burbot were commonly called "mud shark" or "ling cod." Burbot prefer deep water in lakes or rivers where they habitually feed on or near the bottom. Their migratory patterns are not well known, although they are believed to be rather sedentary except for definite movements toward spawning areas. Burbot are winter spawners.

Kotzebue residents primarily caught burbot incidental to jigging for sheefish on "Kobuk Lake" (Hotham Inlet) in spring. In some Kobuk River communities, burbot were the focus of nighttime fishing efforts through the ice in fall, but this was not practiced in the Kotzebue vicinity. Kotzebue residents particularly enjoyed eating the liver and roe of burbot.

Expanded survey results showed that in 1986 Kotzebue residents harvested an estimated 739 burbot, or 3,105 edible pounds, accounting for .3 percent of Kotzebue's total harvest of wild food (Tables 9 and 11). The average household harvest of burbot was 4.1 pounds (about one fish). The average per capita harvest was 1.2 pounds. Twenty-three percent of Kotzebue households harvested burbot, ranking eighth among fish resources in terms of harvest participation. Burbot was used by 34.1 percent of Kotzebue households.

Rainbow Smelt

Somewhat smaller than herring, rainbow smelt were seasonally abundant fish that spawned early in spring near stream mouths and in shallow, brackish water. In the Kotzebue area, smelt were harvested through the ice with hand lines in spring (March and April) and fall (October and November), often incidental to saffron cod fishing. They were also harvested in late May or early June incidental to herring fishing. The community of Buckland had the largest smelt harvest in the region according to local reports, and dried smelt from this community was a delicacy in Kotzebue.

Smelt were harvested fairly frequently during the season by Kotzebue residents, but not in great numbers. Expanded survey results showed that an estimated 16,885 smelt were harvested in 1986 for an edible weight of 2,364 pounds (Table 9). This comprised a very small portion (0.2 percent) of Kotzebue's harvest of wild food (Table 11). The average household harvest of smelt was 3.1 pounds (about 22 fish) and the average per capita harvest was 0.9 pound (about six fish). About 17.5 percent of Kotzebue households harvested smelt during the study year. A small amount of exchange occurred with 6.8 percent of Kotzebue households receiving smelt and 4.7 percent giving some away.

Flounder

Flounder are flat, bottom-feeding marine fish. Two species -- the arctic flounder and the starry flounder -- were found in Kotzebue Sound. These fish tend to move inshore in summer, sometimes into very shallow water, and offshore into deeper water in winter. Spawning usually takes place in spring.

Flounder were generally not highly regarded by Kotzebue residents, largely because they constantly got caught in salmon nets and were considered bothersome to remove. Flounder were also taken incidental to jigging through the ice for saffron cod or sheefish. Most Kotzebue residents did not keep the flounder they caught, although large flounder caught in fall when their meat was firm were appreciated by some people. One interviewed fisherman set nets in late fall specifically for flounder to give to his wife's father. Flounder were most commonly cooked and used for dog food. One household said they were given two drums full of flounder which they used for dog food in summer.

Expanded survey results showed an estimated harvest of 10,678 flounder in 1986 for an edible weight of 11,746 pounds (Table 9). Flounder accounted for 1.1 percent of Kotzebue's total harvest of wild food and 2.7 percent of Kotzebue's fish harvest (Table 11). The average household harvest of flounder was 15.4 pounds (about 14 fish). The average per capita harvest was 4.4 pounds (about four fish). However, as described above, much of this harvest was probably not consumed by people, but by dogs.

Because flounder was not a widely desirable fish, harvest participation was low, at 7.3 percent of Kotzebue households (Table 9). Limited sharing of flounder occurred during the study year with 2.2 percent of households receiving flounder and 1.1 percent giving some away. In 1986, flounder was used by 9.5 percent of Kotzebue households.

Sculpin

In the Kotzebue area, sculpins were locally known as "bullheads." They were bottom-dwelling, primarily marine fish with large heads and sharp spines. The slimy sculpin and fourhorn sculpin were the two species common to Kotzebue Sound.

Sculpins were rarely, if ever, the focus of fishing efforts by Kotzebue residents in the 1980s. They were primarily caught incidental to other fishing activities, especially jigging through the ice for saffron cod and sheefish. Kotzebue residents frequently left any sculpins they caught on the ice "for the ravens and gulls," or threw them back into the water. However, one interviewed woman said her mother ate the roe, liver, and meat of sculpins. Some residents cooked sculpins for dog food after removing the heads whose sharp spines were considered dangerous for dogs. Most sculpins caught in the Kotzebue area were very small and had little meat, perhaps the main reason they were not a commonly used subsistence food. Uhl and Uhl (1977:22) report that large sculpins were formerly speared in spring in ice cracks along Cape Krusenstern beaches.

Expanded survey results showed that Kotzebue residents harvested an estimated 6,678 sculpin in 1986 for an edible weight of 1,402 pounds (Table 9). This accounted for 0.1 percent of Kotzebue's total harvest of wild food (Table 11). The average household harvest was 1.8 pounds (about eight fish) and the average per capita harvest was 0.5 pound (about two fish). Survey results showed that 4.2 percent of Kotzebue households harvested sculpin during the study year. Because of their minor role in the local diet, sculpin were not widely shared. No sampled households reported receiving sculpins; 1.1 percent of households said they gave some away.

Longnose Sucker

A bottom-feeding, freshwater fish, the longnose sucker is found throughout most of mainland Alaska. It typically lives in lakes and slow, deep pools, moving to shallower water to

spawn in summer (Morrow 1980:173-174). Except for this latter movement, the longnose sucker did not appear to make any definite migrations.

In Kotzebue, suckers were incidentally caught in nets and rarely, if ever, the target of fishing. They were not highly regarded as a food item and most Kotzebue residents threw them back in the water or left them for birds to eat. Residents with dogs often used them for dog food. One interviewed man said he had never eaten suckers, but his father used to say they were good to eat when dried.

Kotzebue residents harvested an estimated 615 suckers in 1986 for an edible weight of 861 pounds (Table 9). These had a very minor role in Kotzebue's total harvest of wild food, accounting for less than 0.1 percent of the harvest. The average household harvest of suckers was 1.1 pound (less than one fish) and the average per capita harvest was 0.3 pound. Suckers were harvested by 1.9 percent of Kotzebue households, among the lowest of the fish resources in terms of harvest participation. No sampled households reported receiving or giving away suckers.

Alaska Blackfish

Alaska blackfish are sluggish, bottom-dwelling fish that live in densely vegetated areas of lowland swamps, ponds, sloughs, and lakes. They seldom grow longer than eight inches. Spawning occurs from May to August. Blackfish are unusual in that they can breathe atmospheric oxygen, enabling them to survive in stagnant pools and even in moist tundra mosses when necessary. In winter they congregate in areas of open water. A hardy creature, blackfish have the reputation for being able to survive after being frozen in ice.

Although blackfish were used in the past as food for humans and dogs, they were rarely harvested by Kotzebue residents in recent times. Many sampled households were not familiar with blackfish or its uses, although older people often remembered having used them in the past. One interviewed woman originally from Noorvik said she used to catch lots of blackfish when

she was young. Of the 90 sampled households, only one harvested blackfish in 1986. A member of this household was from a Yukon River delta community and returned to her home community in summer to fish. Her harvest there included 90 blackfish. Based on this, the expanded harvest for Kotzebue was 276 blackfish, or an edible weight of 19 pounds (Table 9). This was among the least harvested resources by Kotzebue residents. Survey results showed that blackfish were harvested by 0.4 percent of Kotzebue households. No sharing or exchange of blackfish were reported by sampled households.

Nine-Spine Stickleback

The nine-spine stickleback is a small fish (usually three inches or less) with a circumpolar distribution. It requires fresh water for spawning, but in coastal areas may winter at sea. Spawning occurs in shallow water in the spring and summer, with overwintering areas in deep water. Sticklebacks are able to tolerate low oxygen concentrations in water (Morrow 1980:192).

Because of their small size, sticklebacks were rarely harvested in the Kotzebue area in the 1980s. They were often very abundant in the Cape Krusenstem area lagoon outlets where whitefish were harvested in fall, and were occasionally cooked for dog food at that time (Uhl and Uhl 1977:22). One respondent in this study said sticklebacks had too many spines for humans to eat, but made good food for dogs.

Of the 90 households sampled in this study, none reported harvesting or using sticklebacks in 1986. No households attempted to harvest sticklebacks or received any from other households.

Clams, Mussels, and Shrimp

Although well-liked by Kotzebue residents, intertidal resources such as clams and mussels were not readily available in the Kotzebue Sound area due to very slight tide differentials. Fall storms occasionally washed up clams, mussels, shrimp, and other marine invertebrates along

Kotzebue Sound where local residents gathered them from the beach (Uhl and Uhl 1977:23). This was the most common, but not only, method of harvesting these shellfish. One respondent said he ate shrimp from bearded seal stomachs if still fresh. Another household harvested clams on an annual trip to the Kenai Peninsula to visit friends.

Three of the 90 sampled households harvested clams in 1986; none harvested mussels or shrimp. Expanded survey results showed an estimated total harvest of 152 pounds of clams by Kotzebue residents or an average household harvest of 0.2 pound (Table 9). This accounted for less than 0.1 percent of Kotzebue's total harvest of wild food. Clams were harvested by 1.8 percent of Kotzebue's households in 1986. About 4.5 percent of Kotzebue households received clams, mussels, or shrimp and 0.7 percent of households gave some away. A total of 6.3 percent of Kotzebue households used these resources in 1986.

Crab

Marine waters north of the Bering Sea were generally considered marginal habitat for crab. There were no commercial fisheries for crab in Kotzebue Sound and no regular subsistence fishing efforts by residents of Kotzebue. However, local fishermen reported occasionally catching large crabs incidentally in their salmon nets, particularly when fishing offshore. These they kept and ate. Fall storms also occasionally washed crabs up onto beaches in the *Sisualik* area, where the largest ones were gathered and eaten (Uhl and Uhl 1977:24). In 1993, one Kotzebue resident for the first time caught several large king crab in pots he set in southwestern Kotzebue Sound. However, perhaps the most frequent method by which Kotzebue residents obtained crab was through sharing and trade with relatives and friends in Nome or other Seward Peninsula communities where subsistence king crab fishing had a long tradition. Kotzebue residents typically traded sheefish or caribou in exchange for Bering Sea crab. This exemplified the common practice in northwest Alaska of exchanging a locally abundant wild food for a locally scarce wild food that was abundant elsewhere.

Expanded survey results showed that 1.5 percent of Kotzebue households harvested crab in 1986 for a total of 77 crab or 1,636 edible pounds (Table 9). Crab was a very minor resource in Kotzebue's wild food harvest, accounting for less than 0.1 percent of the total harvest. A total of 10.0 percent of Kotzebue households used crab during the study year, most of which was king crab. Crab was given away by 0.8 percent of Kotzebue households and received by 8.6 percent of Kotzebue households; this latter percentage likely reflected the distribution of crab from Seward Peninsula households to Kotzebue households.

BERRY AND PLANT GATHERING

Kotzebue residents used berry and plant resources (*nauriat*) as a supplement to their primary diet of fish and meat. Although berries and plants did not constitute a substantial part of the harvest in terms of pounds (Fig. 19), they provided important nutrition and added welcome diversity to the daily fare. With the arctic's short growing season, berries and plants were very seasonal resources as were many other wild foods available in the Kotzebue area.

In 1986, berry and plant gathering had one of the highest levels of harvest participation (57.7 percent of households) of any major resource category. This was second only to participation in fishing (Fig. 18). Berries or plants were used by 81.2 percent of Kotzebue households during the study year (Table 9). Berries accounted for the overwhelming majority (92.3 percent) of Kotzebue's total berry and plant harvest. Greens accounted for 7.6 percent and roots for 0.1 percent of Kotzebue's berry and plant harvest (Table 11). Information on the harvest and use of these resources follows; scientific and Iñupiaq names appear in Appendix 5. Researchers did not collect harvest data for berries and plants on a species level.

Berries

Berries were by far the major plant food gathered by Kotzebue residents in the mid-1980s. In late summer, Kotzebue residents routinely checked on ripening berries and word passed quickly when they were ready for picking. Women, who were the primary berry pickers in the community, spent many hours on the tundra collecting berries, sometimes accompanied by their husbands and children. One Kotzebue woman said, "You have to be quick to get berries. People are competitive with berries. They'll be gone if you wait too long." The abundance of berries varied from year to year depending on several weather factors, most importantly temperature and moisture. Although some people traveled by boat to reach good berry-picking areas, many others picked in the tundra near Kotzebue, especially between "Cemetery Hill" and "Sadie Creek." In August, vehicles were parked in nearly every pullout along the beach road, its passengers having climbed the bluff in search of berries.

The most prized berries, and the first to ripen, were salmonberries, also called cloudberry. These grew in the tundra, sometimes in thick patches. Salmonberries were harvested at the very end of July and in the first two weeks of August. The most productive picking areas were at *Salluq* and *Anigaaq* near Cape Krusenstern and on the Noatak River delta, all of which were accessible by boat. The hills near Kotzebue were also intensively used for berry picking because these were easily accessible by foot, all-terrain vehicles, and highway vehicles.

Blueberries were the second to ripen, usually ready for picking by the second week of August. When berries were abundant, a spoon-shaped wooden tool called *qallutaq* was sometimes used to knock berries into a bucket to harvest them faster. The berries were cleaned by slowly pouring them into another bucket in a windy area allowing the leaves to blow away.

Lowbush cranberries ripened around the second week of September. They commonly grew on tussocks in the tundra, often in thick patches. A *kumigaun* or berry-picking tool was sometimes used to pick berries faster. Cranberries were not as highly regarded as salmonberries

and blueberries, but were still well-liked. They were sometimes cooked with dried fruits such as apples, peaches, apricots, and raisins or with flour.

Blackberries, also called crowberries, were the last to ripen. These were usually harvested in September. A *kumigaun* was also used to harvest these if time was limited, although women generally preferred to handpick blackberries. *Sisualik* was a popular area for blackberry picking.

Large quantities of berries were often stored in wooden barrels in cool places while smaller amounts were put in plastic bags in freezers. Throughout the region, berries provided a satisfying dessert. They were often eaten with sugar and milk and accompanied by tea and hardtack crackers. Berries were also a main ingredient in *akutuq* (Eskimo ice cream).

Expanded survey results showed that an estimated 19,139 pounds of berries were harvested by Kotzebue residents in 1986, accounting for 1.8 percent of the community's total harvest of wild food (Tables 9 and 11). The mean household harvest was 25.0 pounds of berries and the mean per capita harvest was 7.1 pounds. Berries ranked tenth among all resources in terms of pounds harvested. Among the sampled households, berry harvests ranged from 0 to 260 pounds.

More households (56.6 percent) harvested berries than any other single resource during the study year (Table 9). Participation was high both because berries were well-liked and because berry picking required little skill or equipment and could take place in areas easily accessible from Kotzebue. Berries were among the more widely shared resources with 20.5 percent of households giving some away and 39.6 percent of households receiving some. A total of 81.2 percent of Kotzebue households used berries; only caribou and salmon were used by more households.

Greens

Several species of green plants were gathered for food by Kotzebue residents in the 1980s. Perhaps the most common was sourdock which grew on grassy lowlands around lakes and rivers. Sourdock was gathered in July. Women walked to likely places in search of them, snapping off

the leafy green plants at the stem and putting them in a gunny sack or trash bag. At home, the stems were removed and the leaves torn or chopped into smaller pieces and boiled in large pots until soft. When sufficiently cooked, the leaves were dipped out with a wire ladle and then mashed with a spatula so as not to be stringy. Sourdock was stored in wooden barrels in a cool place or in plastic bags in the freezer or refrigerator. It was eaten with sugar or seal oil and served as a side dish with half-dried, roasted, or boiled fish. Sourdock was also mixed with berries, sugar, and seal oil to make a dessert.

Rhubarb was another plant used by Kotzebue residents. This commonly grew on river banks and along sloping knolls near lakes and rivers. Rhubarb was usually gathered in June. The best time to gather it was when the stems snapped easily. When the stems were hard to snap, the cooked product was likely to be stringy.

A third plant used by Kotzebue residents in small quantities was willow leaves. These were picked early in spring when the leaves were young and tender. They were stored in jars with seal oil or in plastic bags in the freezer. Willow leaves were often served with baked or boiled fish.

Kotzebue residents collected other plants as well. Tundra tea or Labrador tea, found almost anywhere on the tundra, was added to commercial teas for a pleasant taste. Other plants were used to lesser degrees for food, flavorings, and medicine.

Expanded survey results showed an estimated harvest of 1,575 pounds of greens by Kotzebue residents in 1986 (Table 9). This was an average household harvest of 2.1 pounds and an average per capita harvest of 0.6 pound. Greens were a very small component (0.1 percent) of Kotzebue's total harvest of wild food (Table 11). Of the sampled households, harvests ranged from 0 to 68 pounds of greens. An estimated 16.1 percent of Kotzebue households harvested greens and 18.4 percent used greens during the study year. Greens were given away by 8.3 percent of households and received by 3.1 percent of households.

Roots

Eskimo potato (*masu*) and cotton grass were the main roots gathered by Kotzebue residents in the 1980s. Women were primarily responsible for gathering these roots although men also assisted in searching for them. Gathered in September, *masu* was usually found along rivers and streams and was identified by its leaves which by that time of year had turned to fall color. A digging tool called *sikḷaq* or *masunniun* was used to unearth the roots.

The most popular and productive way to harvest roots was to take them from food stores of voles, locally called "mouse caches." In the fall, voles gathered roots and other food and stored them in underground caches in wooded or sandy areas. Local residents walked around in likely locations, looking for the caches by feeling for soft spots in the ground with their feet. When a cache was located, the roof was carefully lifted and the roots taken out. Only the largest roots were kept with the rest returned along with dried fish to replace the food that was taken. This was done in appreciation of the effort spent by the voles to gather the roots. Using little twigs for support, the mouse cache was recovered.

Masu tasted similar to parsnips, but sweeter. They were cleaned after being gathered and stored in seal oil or put in a freezer in plastic bags. Roots were boiled and served with meat and fish or were mixed with blueberries for dessert.

Expanded survey results showed that Kotzebue residents gathered an estimated 25 pounds of roots in 1986 (Table 9). This contributed a very small percentage (less than 0.1 percent) to Kotzebue's total harvest (Table 11). Roots were gathered by 0.4 percent of Kotzebue households. Respondents reported that the harvest of roots was unusually poor in 1986 because of heavy rainfall and flooding in fall. The survey year should not be considered representative of other years with different conditions.

CHAPTER 5

EXCHANGE OF WILD RESOURCES

The exchange of wild resources remained a fundamental part of northwest Alaska Iñupiaq life in the mid-1980s. It was so ubiquitous that it was virtually impossible for most Kotzebue households to count the number of times they received or gave away wild foods during the course of a year. Some households hunted or fished little themselves, receiving most of their wild foods from others. Other households hunted and fished repeatedly, giving away substantial portions of their catch. Certain specialty foods or delicacies, such as resources with limited availability or prepared in special ways, ranged particularly far in exchange networks.

The 1986 survey collected data on the types of wild resources exchanged by Kotzebue residents and the communities with which these exchanges took place. Researchers inquired about three types of exchanges: barter, in which one item was directly exchanged for another item; trade, in which cash was a component of the transaction; and generalized sharing, in which there was no expectation of a return.

BARTER

Expanded survey results showed that an estimated 31.0 percent of Kotzebue households engaged in the barter of wild resources in 1986. Participation in bartering had a direct relationship with harvest group: households in the high-harvest group participated most widely (56.7 percent of households) and those in the low group least widely (26.7 percent). Households in the medium-harvest group fell between these two (30.0 percent). The high group's greater participation in bartering was likely due to its having more surplus resources available for exchange.

Based on survey results, Kotzebue households engaged in an estimated total of 560 barter transactions involving wild resources in 1986. These included transactions in which households directly exchanged one item for another, such as caribou for seal oil or gasoline for sheefish. Fish accounted for the largest proportion (31.0 percent) of all items exchanged in barter transactions, followed by groceries and fuel (17.3 percent), marine mammal products (16.3 percent), and meat from big game (14.2 percent) (Table 16). Sheefish, caribou, groceries, and seal oil were the specific items most widely exchanged by barter. Excluding groceries, these resources corresponded closely with those most heavily harvested by Kotzebue residents, namely caribou, bearded seal, salmon, and sheefish.

More than one-half (55.0 percent) of the barter transactions in 1986 took place among Kotzebue residents. The next most common (24.6 percent) were barter transactions between Kotzebue and communities outside the region such as Anchorage, Nome, and North Slope communities. The third most common (20.4 percent) were barter transactions between Kotzebue and other communities in the Northwest Arctic Borough.

The types of items exchanged between communities were fairly predictable, reflecting the differences in resource availability in the different communities. For instance, Kotzebue residents frequently bartered seal oil with Selawik and Kobuk River communities in exchange for dried fish or furs. Kotzebue residents exchanged such items as sheefish, saffron cod, and berries for "black meat" (dried bearded seal), muktuk, and ivory from Kivalina, Point Hope, Wainwright, and other North Slope communities. Barter between Kotzebue and Nome most frequently involved the exchange of sheefish for king crab.

TRADE

Trade is a second way that households exchanged wild resources. For this study, trade was considered a direct exchange on a limited scale of wild resources and cash. According to the survey, Kotzebue households engaged in an estimated total of 408 trade transactions in 1986,

TABLE 16. ITEMS EXCHANGED IN WILD RESOURCE BARTER,
KOTZEBUE, 1986.

Barter item	Percentage of total items bartered (N=1,120)
Fish	31.0
Sheefish	10.2
Dried fish	5.9
Salmon	5.1
Shellfish	3.5
Whitefish	1.2
Saffron cod	0.5
Smelt	0.3
Other	4.3
Marine Mammal Products	16.3
Seal oil	9.1
Muktuk	4.1
Ivory	2.4
Dried bearded seal meat	0.7
Other Wild Resources	24.4
Caribou	9.3
Berries	6.6
Moose	4.9
Furs	3.3
Wood	0.3
Groceries and Fuel	17.3
Groceries	9.3
Gasoline	7.6
Propane	0.4
Other	11.0
Clothing	1.6
Sled	0.9
Lodging	0.5
Dog food	0.3
Miscellaneous	7.7

Source: Division of Subsistence, ADF&G, household survey 1986. Barter by sampled households was expanded on a household basis to estimate total community barter.

somewhat fewer than the 560 barter transactions estimated for the same year. In most cases (86.8 percent), this involved a transaction between two individuals. However, in a few cases (13.2 percent), this involved a transaction between an individual and a store. Local stores, for example, often seasonally sold muktuk and dried fish even though neither of these products were commercially harvested. Researchers did not include as trade the purchase from a store of commercially harvested resources such as salmon, sheefish, and reindeer.

Paniqtuq (dried fish or meat) was the item Kotzebue households most frequently exchanged for cash. This was involved in 19.6 percent of trade transactions in 1986. Following this were skins and furs (16.7 percent), seals and seal oil (16.4 percent), and sheefish (11.3 percent). Native crafts, Dolly Varden, caribou, muktuk, and assorted other fish including whitefish and burbot were also frequently reported as trade items by Kotzebue households (Table 17).

Persons with resources to trade frequently advertised their wares on the local radio station's Swap-N-Shop program. The following is a sampling of such announcements in 1987:

Gunnysack of whitefish for sale. \$1.00 per pound.

Five- to six-pound blocks of black muktuk for sale at \$15.00 per pound. First come, first served.

Five gallons of seal oil with blubber and meat for sale for \$100.

Plain seal oil for sale: \$2.00 per pound. Dried ugruk meat: \$3.50 per pound. Paniqtuq mixed with cooked meat: \$2.50 per pound. One whole ugruk skin for mukluk bottoms: \$105.

Beluga muktuk for sale. \$4.00 per pound.

Fall-time Kivalina "trout" for sale. \$2.25 per pound.

Blueberries and cranberries for sale. \$100 for five gallons.

Five marten skins for sale from Huslia. \$50 each.

One large, dark wolverine skin with long hair for sale. \$500. [Seller in Hughes.]

70 muskrats from Noorvik for sale. Also a wolf and wolverine skin.

These advertisements illustrate the lively and diverse nature of the resource trade in Kotzebue during the course of a year. Many other resource exchanges took place in less public

TABLE 17. WILD RESOURCES TRADED, KOTZEBUE, 1986.

Resource	Percentage of trade transactions (N=408)
Paniqtuq (dried fish or meat)	19.6
Skins and furs	16.7
Seals and seal oil	16.4
Sheefish	11.3
Native crafts	9.8
Other fish	8.8
Dolly Varden	6.8
Caribou	5.4
Muktuk	5.2

Source: Division of Subsistence, ADF&G, household survey 1986. Trade reported by sampled households was expanded on a household basis to estimate total community trade.

settings, such as when Kotzebue residents traveled to surrounding communities and when residents of surrounding communities traveled to Kotzebue. Resources were most commonly available for trade "in-season." For example, berries were typically available for trade in late summer and fall, muktuk in spring, and furs in late winter. Although not addressed in the survey, informal observations by the researchers indicated that Kotzebue residents usually offered resources for trade when they had a surplus available, and not as a routine matter of course.

GENERALIZED SHARING

Generalized sharing to relatives, elders, and friends was by far the most widespread type of exchange in Kotzebue in 1986. This type of exchange was so common that most households were unable to estimate the number of times they received or gave away wild foods during the course of a year. For Iñupiaq households, there was a strong cultural belief that the more a person gave away, the easier it was to get. One hunter attributed his easy success in hunting to his widespread sharing of his harvest.

Rather than estimate the total number of times households shared resources, researchers instead were interested in the general geographic pattern of resource exchange in a regional center. Respondents were asked with which communities they shared seven selected resources: caribou, moose, seal, beluga, salmon, Dolly Varden, and whitefish. Sharing included either receiving or giving resources. Researchers then defined each of these combinations of community-resource as a sharing event. Information on the frequency of a reported sharing event was not collected; however, each event occurred at least once, and perhaps more than once, during the study year.

For example, one household reported receiving caribou from a Kotzebue resident and a "Kobuk Lake" (Hotham Inlet) camp resident (two sharing events); giving seal to a Kotzebue resident and a Selawik resident (two events); receiving beluga from a Kivalina resident (one event); giving salmon to a Kotzebue resident (one event); receiving Dolly Varden from a Noatak

resident and giving Dolly Varden to a Kotzebue resident (two events); and receiving whitefish from a Kotzebue and a Selawik resident (two events) -- a total of ten sharing events. This household, however, might have on several occasions shared caribou or seal with Kotzebue residents, and thus their actual sharing might be considerably more than represented in the survey results.

Expanded survey results showed that Kotzebue households participated in a total of 4,403 of the sharing events described above. More than one-half (55.0 percent) of the sharing events took place among Kotzebue households (Table 18). This was not surprising given the widespread kinship ties and the daily interaction Kotzebue residents had with each other in the home, the neighborhood, and the workplace, facilitating distribution of wild foods. One-third (33.3 percent) of the sharing events took place between Kotzebue and the ten other communities in the Northwest Arctic Borough and 11.7 percent took place between Kotzebue and other areas of Alaska and other states.

Of the sharing events between Kotzebue residents and residents of other communities, Noatak accounted for the most, followed by Noorvik and Kivalina, Selawik, the North Slope region, and Kiana (Table 18). In the cases of Noatak, Noorvik, Kivalina, Selawik, and Kiana, the higher percentage of sharing events could likely be explained by their greater kinship ties with and their closer proximity to Kotzebue. The sharing events with the North Slope region reflected Kotzebue residents' desire for North Slope resources such as beluga and bowhead muktuk which were not always sufficiently available in the Kotzebue area.

Comparatively little sharing was reported between Kotzebue and the upper Kobuk River communities of Ambler, Shungnak, and Kobuk. The same was true for the northern Seward Peninsula communities of Deering and Buckland. This was likely the result of their distance from Kotzebue, their fewer kinship ties to Kotzebue, and the absence of a highly desirable food in their resource base that was not also available in Kotzebue (as in the case of muktuk from North Slope communities).

TABLE 18. COMMUNITIES WITH WHICH KOTZEBUE RESIDENTS
SHARED SELECTED WILD RESOURCES, 1986.

Community	Percentage of sharing events (N = 4,403)
Kotzebue	55.0
Ambler	1.1
Buckland	1.1
Deering	0.0
Kiana	4.8
Kivalina	5.6
Kobuk	0.8
Noatak	6.7
Noorvik	5.6
Selawik	5.1
Shungnak	1.5
Anchorage or Fairbanks	3.4
North Slope region ^a	5.0
Other ^b	4.3

Source: Division of Subsistence, ADF&G, household survey 1986. Sharing reported by sampled households was expanded on a household basis to estimate total community sharing.

(a) Includes communities in the North Slope Borough.

(b) Includes Nome, Shaktoolik, Dillingham, Delta Junction, Kenai Peninsula, Southeast Alaska, and other states.

Specific resources showed different geographic distributions within Kotzebue's exchange network. For example, while the exchange of caribou, moose, and salmon showed no clear geographic pattern, beluga, Dolly Varden, and whitefish showed very strong patterns (Table 19). With the exception of Kotzebue, beluga was exchanged most often with Kivalina and North Slope communities, Dolly Varden with Kivalina and Noatak, and whitefish with Selawik and the lower Kobuk River communities of Noorvik and Kiana. In all these cases, Kotzebue households primarily received these resources from these communities rather than gave.

Other geographic exchange patterns were also evident in Table 19. For example, seal and whitefish were the wild resources most frequently exchanged between Kotzebue and Selawik and between Kotzebue and the Kobuk River communities. Seal was given to these communities by Kotzebue residents and whitefish was received from them. This was a continuation of a very old tradition of exchange between coastal and riverine people as described in Chapter 2. The only clear pattern of exchange that emerged between Kotzebue and the Seward Peninsula and Bering Strait region was that exchange of the selected resources was relatively uncommon there; smelt, sheefish, and shellfish might be items more commonly exchanged between these areas.

In Table 19, the 38.8 percent listed for the North Slope in the "other" column reflects the exchange of muktuk. The "other" category was used to record resources shared other than those listed, but researchers did not press respondents to consider the entire range of resources they might have given or received during the year. Thus, this category likely reflected only a small portion of the sharing of other resources that actually occurred. Because the survey did not ask about every resource, it is possible that other resources were shared more widely than those listed. Because this study only interviewed a sample of Kotzebue residents, not every selected resource exchange that actually occurred between Kotzebue and another community was documented. Therefore, information present in Table 19 cannot be interpreted to represent the entirety of Kotzebue's exchange of these resources.

TABLE 19. GEOGRAPHIC DISTRIBUTION OF SHARING EVENTS OF SELECTED WILD RESOURCES, KOTZEBUE, 1986.

Community or Subregion	Percentage of Sharing Events							
	Caribou	Moose	Seal	Beluga	Salmon	Char	Whitefish	Other
Kotzebue ^a	60.9	69.2	59.2	45.3	70.5	45.7	33.2	32.3
Lower Kobuk ^b	9.9	8.9	10.4	7.3	6.6	1.1	29.9	16.0
Upper Kobuk ^c	3.1	0.7	8.4	1.1	2.4	1.1	6.3	0.0
Selawik	4.8	3.6	7.7	0.0	1.0	1.8	19.7	1.3
Noatak	4.7	1.1	5.5	0.0	3.1	24.5	8.1	4.7
Kivalina	3.2	3.9	3.4	28.1	0.6	16.3	0.6	0.0
North Slope ^d	3.4	3.9	1.2	17.1	0.4	4.2	0.0	38.8
N. Seward Peninsula ^e	1.1	1.1	0.7	1.1	0.6	1.5	2.2	1.3
Bering Strait ^f	1.6	1.4	1.3	0.0	0.0	0.0	0.0	2.2
Other Alaska	7.3	6.2	2.2	0.0	12.3	3.8	0.0	3.4
Other States	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Division of Subsistence, ADF&G, household survey 1986. Sharing reported by sampled households was expanded on a household basis to estimate total community sharing.

(a) Includes camps on northern Kotzebue Sound and northern "Kobuk Lake" (Hotham Inlet).

(b) Includes Noorvik and Kiana.

(c) Includes Ambler, Shungnak, and Kobuk.

(d) Includes communities in the North Slope Borough.

(e) Includes Buckland and Deering.

(f) Includes communities within the boundaries of the Bering Straits Regional Corporation.

CHAPTER 6

SEASONAL MOVEMENT PATTERNS

Seasonal moves to and from camps for hunting and fishing activities characterized life in many small, rural communities in Alaska in the 1980s. In the larger regional centers like Kotzebue, seasonal camps were also used for harvest activities. Because of the diverse nature of a regional center's population, researchers were interested in exploring Kotzebue's pattern of camp use including the extent to which Kotzebue residents used camps, the location of the camps used, and the relationship of camp use to harvest success.

A second seasonal movement pattern explored by this study was the extent to which Kotzebue residents seasonally traveled to smaller communities to hunt, fish, and gather wild resources. This strategy could allow for the harvest of resources not available in Kotzebue. It might also enable people to harvest resources in a familiar area (if the community were their home community) and with less competition than might exist in a regional center's locale.

A third seasonal movement pattern explored by this study was the extent to which residents of other communities, in particular the region's smaller communities, seasonally moved to Kotzebue for wage employment, commercial fishing, or marine mammal hunting. These were patterns the researchers had informally observed in Kotzebue. The following section discusses each of these seasonal movement patterns in turn.

CAMPS

In the 1980s, seasonal camps were used by Kotzebue residents for a variety of harvest activities. In most cases, camps provided better access to resources and better conditions for preparing and preserving wild foods. The latter was particularly important in a regional center

like Kotzebue where vehicular traffic, dusty roads, lack of space, and the curious stares of summer tourists made drying meat or fish a challenge.

Unlike temporary camps that people hastily erect for a night or two while traveling or hunting, seasonal camps were characterized by fairly permanent structures, long-term locations, and extended periods of use. These structures typically included plywood cabins or wood frames for wall tents, storage sheds or caches, and drying racks for fish or meat. Some camps had look-out towers for spotting game or assessing ice conditions. Used by the same families year after year, seasonal camps typically remained in the same location until changing environmental conditions necessitated a move. Seasonal camps were often occupied for weeks at a time during key harvest periods; others were intermittently used year-round.

Expanded survey results showed that camps were used by slightly more than one-half (51.1 percent) of Kotzebue households in 1986. Camp use was directly related to harvest group: 86.7 percent of households in the high-harvest group used seasonal camps compared with 66.7 percent in the medium-harvest group and 40.0 percent in the low-harvest group. The widespread use of camps by households in the high-harvest group was not surprising given that active hunters and fishermen were more likely than others to have camps that facilitated a large harvest of resources. More surprising was that even in the low-harvest group a significant percentage of households used camps during the study year. Informal observations by the researchers suggested that most Iñupiaq residents of Kotzebue looked forward to opportunities to go to camp as a way to practice cultural traditions and to escape the noise and congestion of town.

Expanded survey results showed that the Noatak River, particularly its lower 50 miles, was the area most widely used for camps by Kotzebue residents in 1986 (Table 20). An estimated 20.8 percent of Kotzebue households used the Noatak River, including places such as *Ikattuq*, Little Noatak Slough, *Kipnik*, Hugo Creek, Agashashok River, and *Sikusuiġaq* (Fig. 24). The lower Noatak River area was used year-round for a variety of harvest activities including fishing, waterfowl hunting, moose hunting, trapping, and berry and plant gathering. Although the lower

TABLE 20. PERCENTAGE OF HOUSEHOLDS USING SEASONAL CAMPS BY AREA, KOTZEBUE, 1986.

Area ^a	Percentage of households
Noatak River	20.8
Northwest coast	17.5
Kobuk River	15.2
Kobuk Lake	4.4
Baldwin Peninsula	3.5
Other	5.6
Did not use camp	48.9

Source: Division of Subsistence, ADF&G, household survey 1986. Camp use reported by sampled households was expanded on a household basis to estimate total community camp use.

Note: Percentages do not add up to 100 because some households used more than one area.

(a) See text for description of areas.

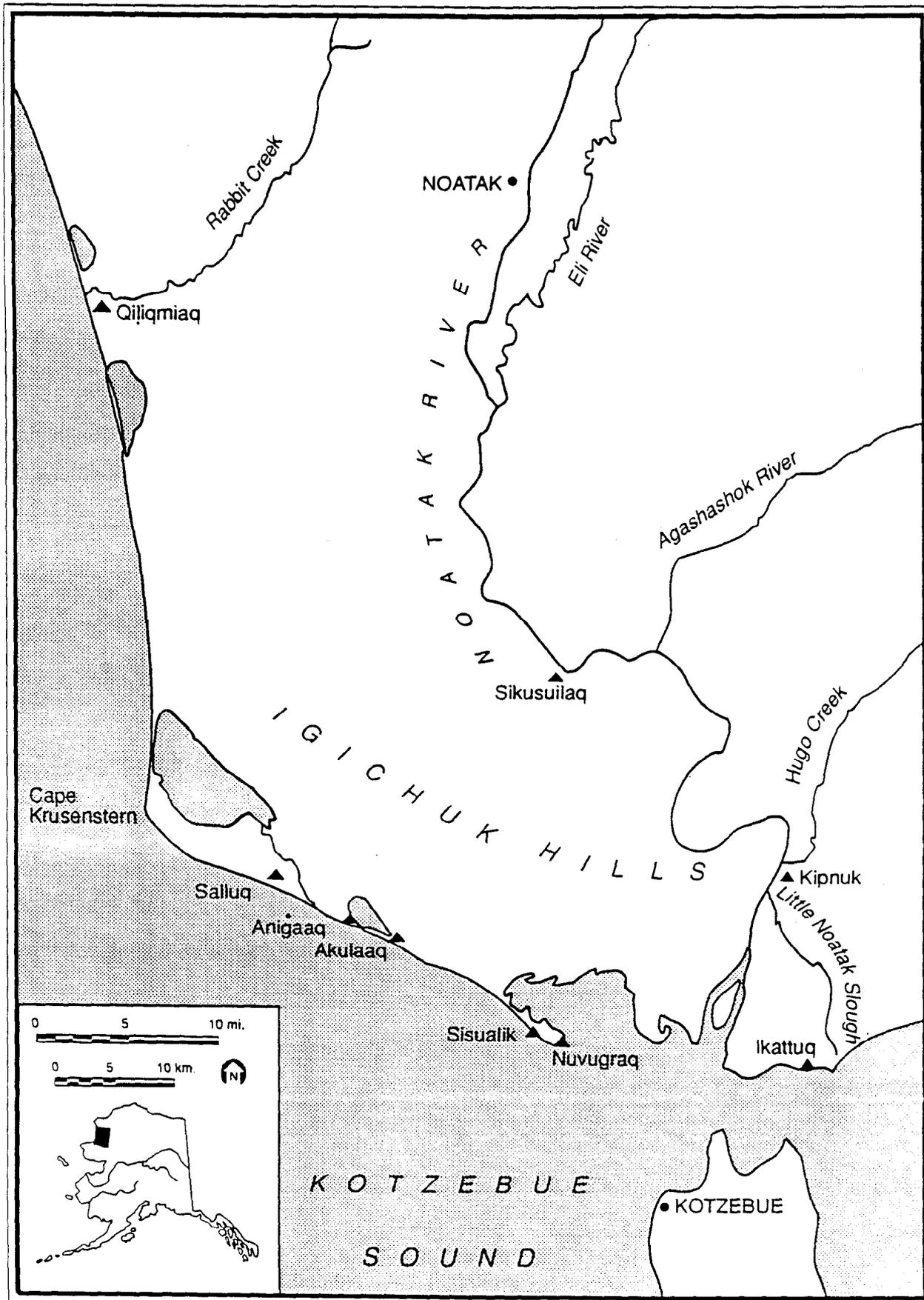


Fig. 24. Geographic features and camp locations in lower Noatak River and Cape Krusenstern areas, as named in text.

Noatak River was not far from Kotzebue, its forested, riverine environment provided an ecological contrast to Kotzebue's coastal tundra.

The second most widely used area for camps was the Kotzebue Sound-Chukchi Sea coast to the northwest of Kotzebue. Camps used in this area stretched along the coast for 50 miles from *Nuvugraq*, ten miles northwest of Kotzebue, to Rabbit Creek, 25 miles south of Kivalina. Expanded survey results showed that an estimated 17.5 percent of all Kotzebue households used this coastal area, including such places as *Nuvugraq*, *Sisualik*, *Akulaaq*, *Anigaaq*, *Salluq*, Cape Krusenstern, *Qiliqmiaq*, and Rabbit Creek (Fig. 24). Many of these locations have been seasonal camps customarily used by Iñupiaq residents of Kotzebue and Noatak for generations. This coastal region, used primarily from April through October for seal and beluga hunting, waterfowl hunting, fishing, berry picking, and plant and egg gathering, continued to be a key harvest area in the 1980s for Kotzebue residents.

The Kobuk River was a third area widely used by Kotzebue residents for camps. Expanded survey results showed that an estimated 15.2 percent of all Kotzebue households used the Kobuk River (Table 20). However, unlike the coastal and Noatak River areas where camps used by Kotzebue residents were concentrated within a 50-mile section, camp locations on the Kobuk River were reported from the delta to above the community of Kobuk, a distance of more than 200 miles. Camp use along the Kobuk River was likely heavily associated with caribou hunting. Kinship ties to Kobuk River communities also might draw some Kotzebue residents to camps in this area. In contrast to the coastal area and the Noatak River mouth, the Kobuk River was not part of the traditional territory of the *Qikiqtaġruymiu*t at the time of western contact (Burch 1980:289). This might account in part for the lack of a clear pattern of land use in the area by Kotzebue residents.

Two other areas near Kotzebue were used for camps by local residents, but by fewer households than the three previously described. The first of these was "Kobuk Lake," or Hotham Inlet, where several Kotzebue families maintained camps along the north shore. Many of these camps were occupied year-round as permanent residences and used additionally for fishing,

hunting, and berry picking by relatives and friends residing in Kotzebue. Expanded survey results showed that an estimated 4.4 percent of Kotzebue households used the "Kobuk Lake" area including such places as *Ivik* and Fish Creek (Fig. 25).

The Baldwin Peninsula was another area used for camps by a small percentage of Kotzebue households; an estimated 3.5 percent of households used this area (Table 20). The Baldwin Peninsula included "North Tent City," "South Tent City," "Sadie Creek," and *Iluviaq*, all of which were immediately adjacent to or very near Kotzebue (Fig. 25). These camps were primarily used from May through October for fishing, seal and beluga hunting, and berry picking. Occasionally these camps were also used in winter particularly by households involved in dog mushing.

Finally, an estimated 5.6 percent of households used areas other than those already described. Sampled households, for example, reported using camps at Selawik River, Fox River, Kivalina River, and "Selawik Hot Springs" (Fig. 2). Most of these were probably used for fishing in the summer and fall with the exception of "Selawik Hot Springs" which was occasionally used for hunting from February to April.

TRAVEL TO OTHER COMMUNITIES FOR HARVEST ACTIVITIES

Expanded survey results showed that an estimated 24.6 percent of Kotzebue households visited another community to hunt, fish, or gather wild resources in 1986. Such travel was directly related to harvest group: 53.3 percent of households in the high-harvest group traveled to another community compared with 33.3 percent in the medium-harvest group and 16.7 percent in the low-harvest group. Kiana was the most commonly visited community (8.2 percent of all Kotzebue households), followed by Noatak (7.4 percent of households), Point Hope (4.7 percent of households), Noorvik (4.5 percent of households), and Ambler (4.1 percent of households) (Table 21).

Although the survey did not collect data on the reasons these communities were visited, researchers' observations offer some suggestions. Caribou hunting most likely brought Kotzebue

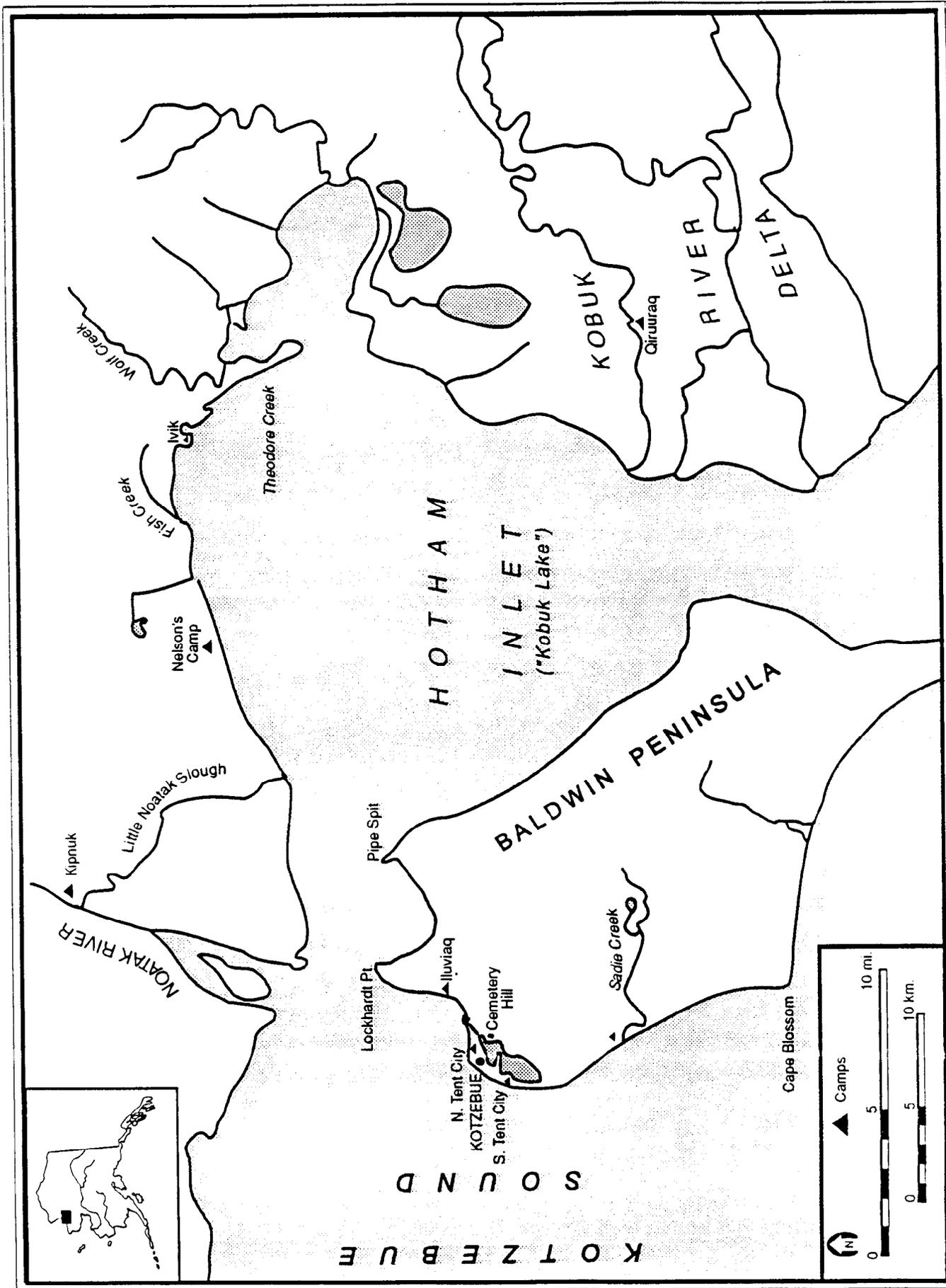


Fig. 25. Geographic features and camp locations in Kotzebue and Kobuk Lake area, as named in text.

TABLE 21. PERCENTAGE OF KOTZEBUE HOUSEHOLDS VISITING ANOTHER COMMUNITY FOR HARVEST ACTIVITIES, 1986.

Community	Percentage of households
Ambler	4.1
Buckland	0.4
Deering	2.2
Kiana	8.2
Kivalina	3.3
Kobuk	0.4
Noatak	7.4
Noorvik	4.5
Point Hope	4.7
Selawik	2.6
Shungnak	2.2
Other	1.5
None	75.4

Source: Division of Subsistence, ADF&G, household survey 1986. Visits reported by sampled households were expanded on a household basis to estimate total community visits.

Note: Percentages do not add up to 100 because some households visited more than one community.

households to Kiana and Ambler, while bowhead whaling likely attracted hunters to Point Hope. Noorvik and Noatak might have been destinations for Kotzebue households interested in caribou and moose hunting, fishing, or furbearer harvest. Kinship also likely played a role in this latter travel pattern; based on the birthplace of household heads and spouses, Noatak and Noorvik were the northwest Alaska communities accounting for the greatest percentage of migration to Kotzebue. Kinship was also likely an important factor in the travels of Kotzebue Native households to the less widely visited communities such as Deering, Buckland, Selawik, and Shungnak. The extent to which kinship influenced travel to Kiana, Ambler, and Point Hope was not known. In general, however, it appeared that the ability to harvest resources not locally available was a major impetus for Kotzebue residents to travel to other communities in the region for harvest activities.

TRAVEL TO KOTZEBUE BY RESIDENTS OF OTHER COMMUNITIES

Expanded survey results showed that an estimated 12.7 percent of Kotzebue households had someone from another community stay with them to work, hunt, or fish commercially in 1986. Of the visitors, an estimated 52.0 percent came to work, 40.8 percent came for commercial fishing, 10.8 percent came for hunting, and a few came for more than one reason. The residences of the visitors reported by sampled households were diverse, ranging from the nearby community of Noorvik to the state of California, from the Iñupiaq community of Shishmaref to the state of Maine, and from the nearby community of Noatak to the state of North Dakota.

In general, no clear pattern of seasonal movement to Kotzebue from other communities emerged from these data. However, because only households permanently residing in Kotzebue were interviewed for this study, residents of other communities who might have temporarily come to Kotzebue, but rented an apartment or stayed in a tent on the beach, both of which occurred, would have been missed. Only those who stayed with a year-round Kotzebue

household would have been counted, and thus the study results probably underestimate the extent to which this movement pattern occurred.

CHAPTER 7

SUMMARY AND DISCUSSION

This study provides quantitative and qualitative information on Kotzebue's subsistence harvest and use of fish, wildlife, and plants in 1986. Harvest estimates and the extent of resource use at the household level are documented for a wide range of species and resource categories available in the Kotzebue area. The report also explores sharing, trade, and barter of wild resources and the geographical pattern of camp use by Kotzebue residents. Information on Kotzebue's history, demography, employment, and income is presented.

The largest community in the Kotzebue Sound region, Kotzebue serves as a regional service and distribution center for the Northwest Arctic Borough, an area of 43,298 square miles with 11 predominantly Iñupiaq Eskimo communities, and for Point Hope, a community in the North Slope Borough. Kotzebue had an estimated population of 2,633 in 1985 and 2,751 in 1990, accounting for about 45 percent of the borough's population. Communities of this size did not exist in northwest Alaska until recently. Despite its relatively large population, Kotzebue remained a predominantly Iñupiaq community with Alaska Natives comprising 75.1 percent of its 1990 population.

Kotzebue differed from smaller, outlying communities in the region not only in the size of its population, but also in its diversity. For example, results from this study showed heterogeneity in the origin of Kotzebue residents: 23.1 percent of the household heads and spouses were born in Kotzebue, 27.7 percent were born in other communities in the Northwest Arctic Borough or Point Hope, and 43.0 percent were born outside Alaska. While 38.3 percent of Kotzebue's household heads and spouses had lived in Kotzebue either all their lives or for more than 20 years, another 44.4 percent had lived there for five years or less. With such a large and heterogeneous population, a regional center like Kotzebue often presents more complex fish and wildlife management situations than smaller, more homogeneous communities.

As a regional center, Kotzebue also had greater employment opportunities than the smaller, outlying communities. Survey results indicated that nearly all Kotzebue households (96.6 percent) had at least some employment in 1986 and more than 70 percent had the equivalent of 52 weeks or more of employment per year. Government dominated Kotzebue's economy and employment opportunities: 69.4 percent of Kotzebue households had at least one person employed by the government in 1986. Local government, primarily the Northwest Arctic Borough School District and the City of Kotzebue, accounted for most of these jobs. Trade and commercial fishing were also significant employment sectors. Gross earnings from commercial fishing, however, were often low, averaging \$6,742 per fishermen per season for the period 1975-86. The mean total income for all Kotzebue households in 1986 was \$40,431, of which an estimated 95.6 percent was earned income. This mean, however, obscures the income disparities between the upper and lower ends: 21.0 percent of Kotzebue households had incomes of less than \$19,999 while 20.1 percent had incomes of \$60,000 or more. An estimated 10.3 percent of households received transfer payments in 1986. The cost of living in Kotzebue was substantially higher than in more accessible parts of the state. Monetary earnings had lower purchasing power for a household in Kotzebue compared with incomes in places like Anchorage or Juneau.

Despite its diverse population and employment opportunities, Kotzebue residents widely participated to varying degrees in the subsistence sector of the local economy. An estimated 78.4 percent of Kotzebue households harvested at least one wild food in 1986 and an estimated 100 percent used at least one wild food in the same year. Fish, plants and berries, and birds and eggs were all harvested by more than one-half of Kotzebue households. The individual resources most widely harvested by Kotzebue households were berries, salmon, caribou, and sheefish. More than one-half of Kotzebue households used caribou, salmon, sheefish, Dolly Varden, whitefish, and berries. Other prominent resources include moose, bearded and ringed seal, waterfowl, ptarmigan, saffron cod, northern pike, arctic grayling, burbot, and Pacific herring.

Perhaps the most unusual feature of Kotzebue's harvest of wild foods was that three very different resource categories -- fish, marine mammals, and big game -- comprised similarly large

portions of the total pounds of resources harvested in 1986. This contrasted with many other communities in rural Alaska where one resource category, often fish, typically accounted for one-half or more of the community's total harvest. In Kotzebue, four species accounted for 74.0 percent of the community's 1986 harvest: caribou (24.4 percent), bearded seal (19.0 percent), salmon (18.4 percent), and sheefish (12.2 percent). The remaining resources each contributed 3.2 percent or less to Kotzebue's wild food harvest by weight. An estimated total of 1,067,278 pounds of edible wild resources were harvested in 1986 by Kotzebue households. This was the equivalent of 1,395.2 pounds per household or 398.1 pounds per capita.

In both harvest participation and harvest quantities, substantial differences existed between Alaska Native and non-Native households. Overall, the per capita harvest of edible wild foods by Native households was 518.1 pounds in 1986, almost five times the per capita harvest of 112.2 pounds by non-Native households. In nearly all resource harvest activities, Native households participated to a greater extent than non-Native households. In general, Native households were more knowledgeable about harvest activities, more tied to harvest activities as an expression of their lives and culture, and more likely to have food preferences encompassing a wider variety of wild resources than non-Native households.

Survey findings pointed to a high degree of sharing of wild resources in Kotzebue. Sharing also commonly occurred between Kotzebue residents and residents of other communities in the region, particularly for specialty resources, such as whitefish from the upper Kobuk River area, bowhead muktuk from the North Slope area, Dolly Varden from Noatak, and Dolly Varden and beluga from Kivalina. Trade and barter of wild resources also occurred as ways to distribute goods between families and communities.

Seasonal camps were widely used by Kotzebue residents for harvest activities. An estimated 51.1 percent of households used seasonal camps in 1986, particularly along the lower Noatak River and along the Kotzebue Sound-Chukchi Sea coast northwest of Kotzebue. Camps were used primarily from April through October, although some were used year-round.

Kotzebue's estimated harvest levels were greater than those of similarly-sized Alaska communities where harvest studies have been done (Table 22). For example, a subsistence study of Barrow in 1987 and 1988 estimated a per capita wild food harvest of 217.1 pounds and 195.6 pounds respectively (Braund and Associates 1989:14-16). In southwest Alaska, residents of the regional center of Dillingham harvested 242.2 pounds of wild food per capita in 1984 (Alaska Department of Fish and Game 1992). In Cordova, in Prince William Sound, the per capita harvest of wild food in 1985 was 163.8 pounds (Alaska Department of Fish and Game 1992). In southeast Alaska, Wrangell residents harvested 164.2 pounds of wild food per capita in 1987 (Alaska Department of Fish and Game 1992). At 398.1 pounds, Kotzebue's per capita wild food harvest was 164 to 243 percent greater than these other communities.

This study demonstrated the continuing prominence of the subsistence sector in Kotzebue's economy, a significant finding in light of the assumptions often made about the role of subsistence in regional centers where the human population is large, the cash economy more diversified, and the employment opportunities greater than in smaller, outlying communities. Subsistence harvest and use of local wild foods also played important roles in the social and cultural well-being of Kotzebue residents. The Kotzebue area was fortunate in 1986 to have generally abundant fish and wildlife resources and only moderate competition from non-local hunters and fishermen, both of which favored Kotzebue residents in their harvest of wild foods.

TABLE 22. COMPARATIVE PER CAPITA HARVESTS FOR KOTZEBUE AND FOUR SIMILARLY-SIZED ALASKA COMMUNITIES.

Community	Year of study	1990 Population	Region	Per capita harvest (pounds)
Kotzebue	1986	2,751	Arctic	398.1
Barrow	1987	3,469	Arctic	217.1
Barrow	1988	3,469	Arctic	195.6
Dillingham	1984	2,017	Bristol Bay	242.2
Cordova	1985	2,110	Pr. William Sd.	163.8
Wrangell	1987	2,479	Southeast	164.2

Source: Alaska Department of Fish and Game 1992; Braund and Associates 1989.

REFERENCES

Alaska Commercial Fisheries Entry Commission

- 1991 Changes in the Distribution of Alaska's Commercial Fisheries Entry Permits: 1975-1990. R. Berning and E. Dinneford, eds. Juneau.

Alaska Consultants, Inc.

- 1984 Subsistence Study of Alaska Eskimo Whaling Villages. Prepared for U.S. Department of the Interior, Anchorage.

Alaska Department of Fish and Game

- 1986 1986 Annual Management Report: Norton Sound-Port Clarence-Kotzebue. Division of Commercial Fisheries, Nome.
- 1988 Caribou Survey-Inventory Progress Report: 1 July, 1987-30 June, 1988. Division of Game, Juneau.
- 1992 Community Profile Database. Vols. 1-6. Cheryl L. Scott, Amy W. Paige, Gretchen Jennings, and Louis Brown, compilers. Division of Subsistence, Juneau.

Alaska Department of Labor

- 1985 Alaska Population Overview. Juneau.
- 1987 Alaska Population Overview: 1985 Estimates. Juneau.
- 1990 Alaska Population Overview: 1988 & Provisional 1989 Estimates. Juneau.
- 1991 Alaska Population Overview: 1990 Census and Estimates.

Alaska Department of Revenue

- 1988 Federal Income Taxpayer Profile 1983-1985 by Alaska Community and Income Level and Filing Status. Juneau.

Alt, Kenneth T.

- 1987 Review of Sheefish (*Stenodus leucichthys*) Studies in Alaska. Division of Sport Fish, Alaska Department of Fish and Game, Juneau, Fishery Manuscript No. 3.

Anderson, Douglas D.

- 1984 Prehistory of North Alaska. In Handbook of North American Indians, Volume 5, Arctic, William C. Sturtevant, gen. ed., David Damas, vol. ed. pp. 80-93. Smithsonian Institution, Washington.

Anderson, Douglas D., Ray Bane, Richard Nelson, Wannu W. Anderson, and Nita Sheldon

- 1977 Kuuvangmiut Subsistence: Traditional Eskimo Life in the Latter Twentieth Century. National Park Service, U.S. Department of the Interior, Washington, D.C.

- Amstrup, Steven C., and Douglas P. DeMaster
 1988 Polar Bear (*Ursus maritimus*). In Selected Marine Mammals of Alaska: Species Accounts with Research and Management Recommendations. Jack W. Lentfer, ed. pp. 39-56. Marine Mammal Commission, Washington, D.C.
- Behnke, Steven R.
 1982 Wildlife Utilization and the Economy of Nondalton. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Technical Paper No. 47.
- Bellrose, Frank C.
 1976 Ducks, Geese, and Swans of North America. Stackpole Books: Harrisburg, Pennsylvania.
- Braund, Stephen R. and Associates
 1989 North Slope Subsistence Study: Barrow 1988. Alaska Outer Continental Shelf Region, Minerals Management Service, U.S. Department of the Interior, Anchorage, Technical Report No. 135.
- Braund, Stephen R. and David C. Burnham
 1983 Kivalina and Noatak Subsistence Use Patterns. Prepared for Red Dog Mining Project, Cominco Alaska. Anchorage.
- Burch, Ernest S., Jr.
 1980 Traditional Eskimo Societies in Northwest Alaska. In Alaska Native Culture and History, Y. Kotani and W.B. Workman, eds. pp 253-304. Senri Ethnological Studies No. 4, National Museum of Ethnology, Osaka, Japan.
 1984 Kotzebue Sound Eskimo. In Handbook of North American Indians, Volume 5, Arctic, William C. Sturtevant, gen. ed., David Damas, vol. ed. pp. 303-319. Smithsonian Institution, Washington.
 1985 Subsistence Production in Kivalina, Alaska: A Twenty-Year Perspective. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Technical Paper No. 128.
- Burns, John J.
 1979 Correspondence to Greg Moore, Subsistence Section, Kotzebue, on average weight and percent of usable meat and fat for seals, beluga, and polar bear. August 30, 1979. Division of Subsistence files, Alaska Department of Fish and Game, Kotzebue, Alaska.
- Cultural Dynamics, Ltd.
 1983 Chukchi Sea Sociocultural Systems Baseline Analysis. Alaska Outer Continental Shelf Region, Minerals Management Service, U.S. Department of the Interior, Alaska OCS Social and Economic Studies Program, Technical Report No. 74.
- DeCicco, Alfred L.
 1985 Inventory and Cataloging of Sport Fish and Sport Fish Waters of Western Alaska with Emphasis on Arctic Char Life History Studies. In Inventory and Cataloging, Vol. 26, Federal Aid in Fish Restoration and Anadromous Fish Studies, pp. 41-134. Division of Sport Fish, Alaska Department of Fish and Game, Juneau.

- Ellanna, Linda J.
1983 Nome: Resource Uses in a Middle-Size Regional Center of Northwestern Alaska. *In* Resource Use and Socioeconomic Systems: Case Studies of Fishing and Hunting in Alaskan Communities. Robert J. Wolfe and Linda J. Ellanna, eds. pp. 85-123. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Technical Paper No. 61.
- Ernest, Jean
1984 The Muskrat in Alaska. Alaska Department of Fish and Game, Juneau, Wildlife Notebook Series.
- Ernest, Jeannette R.
1978 The Hare in Alaska. Alaska Department of Fish and Game, Juneau, Wildlife Notebook Series.
- Fall, James A., Janet Schichnes, Molly Chythlook, and Robert J. Walker
1986 Patterns of Wild Resource Use in Dillingham: Hunting and Fishing in an Alaskan Regional Center. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Technical Paper No. 135.
- Foote, Don Charles
1959 The Economic Base and Seasonal Activities of Some Northwest Alaskan Villages: A Preliminary Study. Submitted to U.S. Atomic Energy Commission.

1961 A Human Geographical Study in Northwest Alaska. Final Report of the Human Geographical Studies Program, U.S. Atomic Energy Commission, Project Chariot.

1966 Human Geographical Studies in Northwestern Arctic Alaska: The Upper Kobuk River Project. The Association on American Indian Affairs, New York.
- Foote, Don Charles and H.A. Williamson
1966 A Human Geographical Study. *In* Environment of the Cape Thompson Region, Alaska, Norman J. Wilimovsky and John N. Wolfe, eds. pp. 1041-1107. U.S. Atomic Energy Commission, Washington, D.C.
- Frost, Kathryn J.
1985 The Ringed Seal (*Phoca hispida*). *In* Marine Mammals Species Accounts. John J. Burns, Kathryn J. Frost, and Lloyd F. Lowry, eds. pp. 79-87. Division of Game, Alaska Department of Fish and Game, Game Technical Bulletin No. 7.
- Frost, Kathryn J., and Lloyd F. Lowry
1986 Marine Mammals of Kotzebue Sound and the Southeastern Hope Basin. Alaska Department of Fish and Game, Fairbanks, Annual Progress Report.
- Gasaway, Bill
1979 Correspondence to Greg Moore, Subsistence Section, Alaska Department of Fish and Game, on dressed weight of moose in Kotzebue area, August 23, 1979. Division of Subsistence files, Alaska Department of Fish and Game, Kotzebue, Alaska.

- Georgette, Susan and Hannah Loon
1987 Unpublished field notes. Division of Subsistence files, Alaska Department of Fish and Game, Kotzebue, Alaska.
- 1991 Subsistence Hunting of Dall Sheep in Northwest Alaska. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Technical Paper No. 208.
- Giddings, J. L.
1952 The Arctic Woodland Culture of the Kobuk River. The University Museum, University of Pennsylvania, Philadelphia.
- 1961 Kobuk River People. Studies of Northern Peoples, No. 1, Department of Anthropology and Geography, University of Alaska, College, Alaska.
- Giddings, J. L., and Douglas D. Anderson
1986 Beach Ridge Archeology of Cape Krusenstern: Eskimo and Pre-Eskimo Settlement around Kotzebue Sound, Alaska. National Park Service, U.S. Department of the Interior, Washington, D.C., Publications in Archeology 20.
- Grauman, Melody Webb
1977 A Historical Overview of the Seward Peninsula-Kotzebue Sound Area. National Park Service, U.S. Department of the Interior, Anchorage.
- Johnson, Rich
1986 Progress Report: Reconnaissance [sic] Survey of the Subsistence/Commercial Whitefish, Northern Pike, and Burbot Fishery in the Village of Selawik with Emphasis on Developing Methods to Monitor its Effect on the Exploited Stocks. Fishery Resources, U.S. Fish and Wildlife Service, Fairbanks.
- Lentfer, Jack W.
1985 The Polar Bear (*Ursus maritimus*). In Marine Mammals Species Accounts. John J. Burns, Kathryn J. Frost, and Lloyd F. Lowry, eds. pp. 27-35. Division of Game, Alaska Department of Fish and Game, Game Technical Bulletin No. 7.
- Loon, Hannah
1987 Unpublished field notes. Division of Subsistence files, Alaska Department of Fish and Game, Kotzebue, Alaska.
- Loon, Hannah and Susan Georgette
1987 Contemporary Brown Bear Use in Northwest Alaska. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Technical Paper No. 163.
- Lowry, Lloyd F.
1985a The Spotted Seal (*Phoca largha*). In Marine Mammals Species Accounts. John J. Burns, Kathryn J. Frost, and Lloyd F. Lowry, eds. pp. 89-96. Division of Game, Alaska Department of Fish and Game, Game Technical Bulletin No. 7.
- 1985b The Ribbon Seal (*Phoca fasciata*). In Marine Mammals Species Accounts. John J. Burns, Kathryn J. Frost, and Lloyd F. Lowry, eds. pp. 71-78. Division of Game, Alaska Department of Fish and Game, Game Technical Bulletin No. 7.

- 1985c The Belukha Whale (*Delphinapterus leucas*). In Marine Mammals Species Accounts. John J. Burns, Kathryn J. Frost, and Lloyd F. Lowry, eds. pp. 3-13. Division of Game, Alaska Department of Fish and Game, Game Technical Bulletin No. 7.
- 1985d The Pacific Walrus (*Odobenus rosmarus divergens*). In Marine Mammals Species Accounts. John J. Burns, Kathryn J. Frost, and Lloyd F. Lowry, eds. pp. 15-25. Division of Game, Alaska Department of Fish and Game, Game Technical Bulletin No. 7.
- Lowry, Lloyd F., John J. Burns, and Kathryn J. Frost
 1987 Recent Harvests of Belukha Whales in Western and Northern Alaska and Their Potential Impact on Provisional Management Stocks. Alaska Department of Fish and Game, Fairbanks.
- Magdanz, James S. and Annie Olanna
 1984 Controls on Fishing Behavior on the Nome River. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Technical Paper No. 102.
- Merkouris, Susan E., and Charles F. Lean
 1988 1987 Annual Management Report: Norton Sound-Port Clarence-Kotzebue. Division of Commercial Fisheries, AYK Region, Alaska Department of Fish and Game, Anchorage.
- Moore, Greg
 1980 Correspondence to Ron Regnart, Anchorage. Alaska Department of Fish and Game, January 29, 1980.
- Morrow, James E.
 1980 The Freshwater Fishes of Alaska. Anchorage: Alaska Northwest Publishing Company.
- Nelson, Robert R., John J. Burns, and Kathryn J. Frost
 1985 The Bearded Seal (*Erignathus barbatus*). In Marine Mammals Species Accounts. John J. Burns, Kathryn J. Frost, and Lloyd F. Lowry, eds. pp. 55-63. Division of Game, Alaska Department of Fish and Game, Game Technical Bulletin No. 7.
- Patterson, Art
 1974 Subsistence Harvests in Five Native Regions. Prepared for the Joint Federal-State Land Use Planning Commission for Alaska. Anchorage: Resource Planning Team.
- Peterson, Roger Tory
 1961 A Field Guide to Western Birds. Boston: Houghton Mifflin Company.
- Rollins, Alden M.
 1978 Census Alaska: Numbers of Inhabitants, 1792-1970. Anchorage: University of Alaska.
- Saario, Doris J. and Brina Kessel
 1966 Human Ecological Investigations at Kivalina. In Environment of the Cape Thompson Region, Alaska, Norman J. Wilimovsky and John N. Wolfe, eds. pp. 969-1039. U.S. Atomic Energy Commission, Washington, D.C.

- Schroeder, Robert, David B. Andersen, and Grant Hildreth
 1987 Subsistence Use Area Mapping in Ten Kotzebue Sound Communities. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Technical Paper No. 130.
- Schwartz, Charles C., Albert W. Franzmann, and David C. Johnson
 1985 Population Ecology of the Kenai Peninsula Black Bear: Progress Report. Division of Game, Alaska Department of Fish and Game, Juneau.
- Seaman, Glenn A., and John J. Burns
 1979 Preliminary Results of Recent Studies on Belukhas in Waters Adjacent to Alaska. Alaska Department of Fish and Game, Fairbanks.
- Seattle Fur Exchange
 1987 January 1987 Auction Report. Seattle, Washington.
- Smith, Valene Lucy
 1966 Kotzebue: A Modern Alaska Eskimo Community. Ph.D. dissertation. Department of Anthropology, University of Utah.
- Stoker, Sam W.
 1983 Subsistence Harvest Estimates and Faunal Resource Potential at Whaling Villages in Northwestern Alaska. *In* Subsistence Study of Alaska Eskimo Whaling Villages, Alaska Consultants, Inc., 1984, pp. A1-A82. Anchorage.
- Stratton, Lee and Susan Georgette
 1984 The Use of Fish and Game by Communities in the Copper River Basin, Alaska: A Report on a 1983 Household Survey. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Technical Paper No. 107.
- Uhl, William R. and Carrie Uhl
 1977 Tagiumsinaaqmiit, Ocean Beach Dwellers of the Cape Krusenstern Area: Subsistence Patterns. Cooperative Park Studies Unit, University of Alaska, Fairbanks, Occasional Paper No. 14.
 1979 The Noatak National Preserve: Nuatakmiit, A Study of Subsistence Use of Renewable Resources in the Noatak River Valley. Cooperative Park Studies Unit, University of Alaska, Fairbanks, Occasional Paper No. 19.
- U.S. Department of Commerce
 1980 Census of Population, Chapter C. General Social and Economic Characteristics. Part 3: Alaska. Bureau of the Census, Washington, D.C.
 1983 Local Climatological Data: Kotzebue, Alaska. National Climatic Data Center, National Environmental Satellite, Data, and Information Service, National Oceanic and Atmospheric Administration, Asheville, North Carolina.
- U.S. Department of the Interior
 1987 Selawik National Wildlife Refuge: Final Comprehensive Conservation Plan, Environmental Impact Statement, Wilderness Review, and Wild River Plan. U.S. Fish and Wildlife Service, Anchorage.

Waring Associates, Kevin

1988 Kotzebue Sociocultural Monitoring Study: Social and Economic Studies. Alaska Outer Continental Shelf Region, Minerals Management Service, U.S. Department of the Interior, Anchorage, Technical Report No. 130.

Weeden, Robert B.

1978 The Ptarmigan in Alaska. Alaska Department of Fish and Game, Juneau, Wildlife Notebook Series.

Wolfe, Robert J.

1983 Understanding Resource Uses in Alaskan Socioeconomic Systems. *In* Resource Use and Socioeconomic Systems: Case Studies of Fishing and Hunting in Alaskan Communities. Robert J. Wolfe and Linda J. Ellanna, eds. pp. 248-274. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Technical Paper No. 61.

Woolford, Ray

1954 Notes on Village Economics and Wildlife Utilization in Arctic Alaska. U.S. Fish and Wildlife Service, Fairbanks.

APPENDIX 1.
SURVEY INSTRUMENT

Date _____
Interview No. _____

KOTZEBUE SUBSISTENCE SURVEY
1987

Subsistence is vital to many people in the NANA region. We are studying how people in Kotzebue use subsistence foods. This information will help decision-makers and other people in the state better understand the importance of subsistence in Kotzebue. You do not have to answer any questions you don't want to. Your name will not be used in this survey.

People in different communities use fish and game in different ways. We are trying to learn what kinds of fish and game Kotzebue residents use, how much they catch, and how fish and game are shared and traded throughout the region. These questions are for hunting and fishing by you or anyone who lived in this house for the past 12 months (1986).

1. Land Animals

	Tried to catch		Trans.	Number caught	Received any?		Give away any?		How much used?
	Y	N			Y	N	Y	N	
Caribou Tuttu									
Moose Tiniikaq									
Sheep Ipniaq									
Black bear Iyyaḡriq									
Grizzly bear Akḷaq									
Porcupine Iḷuqutaq		XXX							
Other		XXX							

Transportation:

- | | |
|-------------------|-------------------------------|
| 1. Boat | 4. Plane (Scheduled vlg. run) |
| 2. Snowmachine | 5. Plane (Private or charter) |
| 3. 3-Wheeler, ATV | 6. Foot only |

2. Sea Mammals

	Tried to catch		Number caught	Received any?		Give away any?		How much used?
	Y	N		Y	N	Y	N	
Bearded seal Ugruk								
Young bd. seal Ugrutchiaq								
Spotted seal Qasigiaq								
Ribbon seal Qiaġutlik								
Ringed seal Natchiq								
Bowhead Aġviq								
Belukha Sisuaq								
Walrus Aiviq								
Polar bear Nanuq								
Other								

3. If you caught the following animals last year, could you estimate how much meat and fat you got off each one after you were finished with the butchering?

Species

Usable Amount (lbs)

- Black bear
- Grizzly bear
- Polar bear
- Belukha
- Adult bearded seal
- Young bearded seal
- Walrus

4. Fur Animals

	Tried to catch		Number caught	No. furs sold	No. used for food	Rec'd any?		Give any?		How much used?
	Y	N				Y	N	Y	N	
Beaver Paŋuqtaq										
Snowshoe hare Ukallaitchak										
Arctic hare Ukallisugruk										
White fox Qusrhaaq					XXX					
Red fox Kayuqtuq					XXX					
Lynx Niituyiq										
Muskrat Kigvaluk										
Marten Qapvaitchiaq					XXX					
Mink Tigiaqpak					XXX					
Land otter Pamiuqtuuq					XXX					
Gr. Squirrel Siksrik										
Weasel Tigiaq					XXX					
Wolf Amaguq					XXX					
Wolverine Qapvik					XXX					

5. Waterfowl and Birds

	Tried to catch		Number caught	Received any?		Give away any?		How much used?
	Y	N		Y	N	Y	N	
Ducks Tiḡmiagruich								
Geese Liḡliq								
Ptarmigan Aqargiq								
Grouse Napaagtum aqargiq								
Crane Tattirgaq								
Snowy owl Ukpik								
Eggs Manniich								
Other								

6. Fish

	Tried to catch		Number caught	Received any?		Give away any?		How much used?
	Y	N		Y	N	Y	N	
Burbot Tiktaaliq								
Flounder Nataagnaq								
Grayling Sulukpaugaq								
Herring Uqsruqtuuq								
Pike Siulik								

	Tried to catch		Number caught	Received any?		Give away any?		How much used?
	Y	N		Y	N	Y	N	
Salmon Qalugruaq								
Smelt Ihuaḡniq								
Sheefish Sii								
Tomcod Uugaq								
Trout Iqalukpik								
Whitefish Quasiluk/Tipuk								
Clams, mussels, shrimp. Uviḷut								
Crab Putyugiat								
Blackfish Iḡiqiḡniq								
Bullhead Kanayuq								
Sucker Milugiaq								
Stickleback Kakiḷisaq								
Other (Qalauq?)								

7. Were any of the salmon that you caught for use at home taken from a commercial net you were fishing this summer?

Yes ___ No ___

If yes, about how many? _____

8. Berries and Plants

	Tried to gather		Amount gathered	Received any?		Give away any?		How much used?
	Y	N		Y	N	Y	N	
Berries Asriat								
Greens Nauriat								
Roots Masu								

9. Sometimes people in regional centers like Kotzebue return to their home villages to hunt, fish, or gather berries and plants. In the past year, have you or other people in this house visited other villages to hunt, fish, or gather berries or plants?

Yes___ No___

Which villages? 1. _____
 2. _____
 3. _____
 4. _____
 5. _____
 6. _____
 7. _____

10. Did anyone from another community come live with you in the past year to work, to commercial fish, or to hunt sea mammals?

Yes___ No___ If yes, from which communities? _____

Community	Work	Comm. Fish	Hunt	Which months?

11. Did you use camps in the region for hunting, fishing, trapping, or gathering in the past 12 months?
Yes ___ No ___ If yes, where were they?

12. Transportation and equipment affect where and how people hunt and fish. How many of the following items does your household have?

- | | |
|-----------------------------|------------------|
| ___ Boat (size, type _____) | ___ Car or truck |
| ___ Outboard (hp _____) | ___ Airplane |
| ___ Three or four-wheeler | ___ Dogs/dogteam |
| ___ Snowmachine | ___ Fish nets |
| ___ Sled | ___ Fish racks |
| ___ Traps | ___ Freezer |

13. If you have dogs, was any of the fish and game you caught used to feed them?
Yes ___ No ___

If yes, what kind and how much of the fish and game you caught were used to feed your dogs?

Species	Amount
_____	_____
_____	_____
_____	_____
_____	_____

14. If you have an airplane, how many trips did you make with it for hunting in the past 12 months?
___trips

In what year did you start using a private plane for hunting? 19__

Could you give a general description of how you use your airplane? (Types of uses, lengths of trips, seasons, areas, changes over time, efficiency, etc.)

15. People in the NANA region often obtain subsistence foods through trading. We are trying to better understand what kind of trading goes on today in the NANA region.

Did you or anyone in this house trade any Native foods or crafts in the past year?

Yes _____ No _____

What was traded? With whom (from which community)?

Item	For	Item	With which community?

16. Have you or anyone in this house ever had a trading partner (Niviqapich)? Yes _____ No _____

17. People in the NANA region also trade cash for subsistence food. Did you or anyone in this house buy or sell any Native foods in the past year? (Exclude commercial salmon sold to fish buyers.)

Yes _____ No _____

What items were bought or sold? Was it from/to a store or individual? From/to which community?

Item	Bought	Sold	Store	Individual	Which community?

18. We are also trying to learn how fish and game are shared among villages and regions. In the past 12 months, with which communities have you shared the following fish or game?

		Kotzebue	Deering	Buckland	Selawik	Noorvik	Kiana	Ambler	Shungnak	Kobuk	Noatak	Kivalina	North Slope	Bering Strait	Anchorage	Fairbanks	Other	(Specify)
Caribou	TO																	
	FR																	
Moose	TO																	
	FR																	
Seal	TO																	
	FR																	
Belukha	TO																	
	FR																	
Salmon	TO																	
	FR																	
Whitefish	TO																	
	FR																	
Other	TO																	
	FR																	

19. Many things can affect how a family hunts and fishes. These can include the size of your family, their ages and birthplace, how long you've lived in Kotzebue, and whether or not you're Native. It would help us to know the following things about the people that live in this house.

Relationship	M/F	Year of Birth	(Only needed for HH and spouse)			
			Place of Birth	Year Moved To Kotzebue	Previous Residence	Native? Y N
1. HH Head						
2. Spouse						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

20. How many hunters live in this house? _____

21. Employment can also influence the way a family hunts and fishes. Some people think subsistence opportunities should be based on a family's income, though many studies suggest that income has little direct relationship to subsistence. It would help us to know about your family's employment and income in 1986.

ID#	Occupation	No. wks. worked	No. hrs. worked/wk	Which months	Amount earned

22. Does anyone in this house own a commercial fishing salmon permit?
Yes_____ No_____

23. Did you or anyone in this house earn money by selling Native crafts?
Yes_____ No_____

(If yes, be sure to include in table above)

24. Did anyone in this house receive checks for retirement, Social Security, unemployment, Adult Public Assistance, Longevity, Aid to Dependent Children, etc., in 1986?
Yes_____ No_____

How much per month? _____

For how many months? _____

25. Do you have any questions about today's survey? Do you have any suggestions for fish and game management in this region?

APPENDIX 2.
EDIBLE WEIGHTS OF FISH AND WILDLIFE RESOURCES,
KOTZEBUE

BIG GAME

Caribou

Live weight: 226 pounds

Conversion factor: 0.6

Edible weight: 136 pounds

Sources: Davis (1985) and Skoog (1968) as cited in Burch (1985:150).

Comments: Caribou were hunted year-round with bulls commonly taken in fall and cows in spring. No data were available on the exact breakdown by sex of the subsistence harvest. The live weight is an average of the monthly average weight of both males and females throughout the year. Parts brought home for use varied from hunter to hunter. While some brought home heads, hides, organs, and intestines, others did not.

Moose

Live weight: 840 pounds

Conversion factor: 0.64

Edible weight: 538 pounds

Sources: Franzmann *et al.* (1978) and Rausch (1978) as cited in Burch (1985:151) for live weight. Gasaway (1979) for edible weight.

Comments: Live and edible weights are averages for bulls and cows combined. Edible weight is skinned carcass less head, lower legs, and guts. Division of Wildlife Conservation staff in Kotzebue estimated that bulls and cows roughly comprised equal parts of the harvest with bulls commonly taken in early fall and cows in late fall and early winter. Like caribou, parts brought home for use varied from hunter to hunter.

Dall sheep

Live weight: 174 pounds

Conversion factor: 0.6

Edible weight: 104 pounds

Source: Wayne Heimer, Division of Wildlife Conservation, pers. comm., May 11, 1987.

Comments: Heimer estimated the live weight of rams at an average of 225 pounds, although this varies significantly from fall to spring. Small rams after a hard winter weigh 150 to 180 pounds. Unusually large rams in fall can reach 300 pounds. Ewes in prime condition at breeding season weigh 120 to 150 pounds; in spring they weigh 100 to 120 pounds.

Researchers used 225 pounds for the live weight of rams (most were taken in late fall or early winter) and 110 pounds for ewes (most were taken in spring). Using Division of Wildlife Conservation records from the 1982-86 subsistence sheep hunts in GMU 23, researchers estimated an overall average live weight for sheep based on the reported percentage of rams and ewes harvested. Kotzebue hunters also took rams in the fall sport hunt so this live weight might be somewhat low.

Brown bear

Live weight: 286 pounds (average for both sexes for months April, May, and September)

Conversion factor: 0.3

Edible weight: 86 pounds

Sources: H.V. Reynolds (1985) and Reynolds and Hechtel (1984:20-23) as cited in Burch (1985:149).

Comments: Grizzly bears were most commonly taken in April, May, and September. While one sampled Kotzebue household harvesting a brown bear took all the meat, some Kotzebue hunters took only the hide or a small portion of the meat. Researchers chose a conversion factor of 0.3 to take into account both patterns.

Black bear

Live weight: 146 pounds

Conversion factor: 0.6

Edible weight: 88 pounds

Source: Schwartz, Franzmann, and Johnson (1985:6).

Comments: Schwartz *et al.* weighed 32 bears captured on the Kenai Peninsula, 44 percent of which were yearlings. Researchers averaged the weights of 20 of these bears to represent a more even cross-section of age classes (eight 1-2 year olds; six 3-5 year olds; five 6+ year olds; and one of unknown age).

MARINE MAMMALS

Bearded seal

Live weight: 612 pounds (average for both sexes April through June)

Conversion factor: 0.67

Edible weight: 420 pounds

Sources: Burns (1977; 1981:151) as cited in Burch (1985:153); Burns (1979); Georgette and Loon field research notes (1987).

Comments: Burns estimated that 50 percent of bearded seal body weight is usable meat (306 pounds). In addition, a bearded seal yields approximately 15 gallons of seal oil. One five-gallon bucket of seal oil without meat weighs 38 pounds. Kotzebue hunters generally used all the meat and fat of bearded seal, while some also used bones, organs, and guts. Bearded seals were most commonly taken in April, May, and June.

Juvenile bearded seal

Live weight: 275 pounds

Conversion factor: 0.63

Edible weight: 176 pounds

Sources: Burns (1977; 1981:151) as cited in Burch (1985:153); Burns (1979); Georgette and Loon field research notes (1987).

Comments: The live weight is the average for both sexes in October and November when they were most commonly harvested. Burns estimated that 50 percent of bearded seal body weight is usable meat (138 pounds). In addition, key respondents estimated that a juvenile bearded seal yields five gallons of seal oil (38 pounds).

Ringed seal

Live weight: 116 pounds

Conversion factor: 0.62

Edible weight: 74 pounds

Sources: Johnson *et al.* as cited in Burch (1985:154); Burns (1979); Georgette and Loon field research notes (1987).

Comments: Live weight is an average for both sexes for the months October through July. Burns estimated that 38 percent of ringed seal body weight is usable meat (44 pounds). According to key respondents, a ringed seal additionally yields four gallons of seal oil (30 pounds).

Spotted seal

Live weight: 165 pounds

Conversion factor: 0.58

Edible weight: 98 pounds

Sources: Bigg (1981) as cited in Burch (1985:154); Burns (1979); Georgette and Loon field research notes (1987).

Comments: Burns estimated that 36 percent of spotted seal body weight is usable meat (60 pounds). Key respondents reported that a spotted seal additionally yields five gallons of seal oil (38 pounds).

Beluga

Live weight: 2,650 pounds (adult)

Conversion factor: 0.37

Edible weight: 995 pounds

Sources: Fay (1971:29) and Klinkhart (1978) as cited in Burch (1985:153) for live weight; Drukker and Gakichko (1935) as cited in Burns (1979).

Comments: Live weight is the average for adult males and females. Soviet research in 1935 revealed that blubber accounts for 30 percent of an adult beluga's body weight (795 pounds). Kotzebue hunters used the blubber and varied in the amount of meat, viscera, and other parts used.

Walrus

Live weight: 2,200 pounds

Conversion factor: 0.35

Edible weight: 770 pounds

Sources: Burns (1978b) and Fay (1981:3; 1982:34) as cited in Burch (1985:154) for live weight; Stoker (1983:A-54) for edible weight.

Comments: Live weight is the average for adult males and females. Kotzebue hunters took few walrus and generally retrieved all of the blubber as well as some of the meat.

Polar bear

Live weight: 775 pounds

Conversion factor: 0.48

Edible weight: 372 pounds

Sources: Lentfer (1978) as cited in Burch (1985:149) for live weight; Burns (1979).

Comments: Live weight is the average for adult males and females. Burns estimated that 33 percent of polar bear body weight is lean usable meat and 15 percent is fat. The one sampled Kotzebue household that harvested a polar bear retrieved the meat and fat as well as the hide.

SMALL GAME AND FURBEARERS

Porcupine

Live weight: 16 pounds

Conversion factor: 0.5

Edible weight: 8 pounds

Source: Behnke (1982)

Beaver

Live weight: 40 pounds

Conversion factor: 0.5

Edible weight: 20 pounds

Source: Behnke (1982)

Snowshoe hare

Live weight: 3.5 pounds

Conversion factor: 0.7

Edible weight: 2.5 pounds

Source: Ernest (1978)

Comments: The average weight of a snowshoe hare is estimated at 3 to 4 pounds.

Arctic hare

Live weight: 9 pounds

Conversion factor: 0.7

Edible weight: 6.3 pounds

Source: Ernest (1978) as cited Burch (1985:150).

Comments: The live weight of an arctic hare is estimated at 6 to 12 pounds.

Muskrat

Live weight: 3 pounds

Conversion factor: 0.6

Edible weight: 1.8 pounds

Source: Ernest (1984)

Comments: The live weight of a muskrat is estimated at 2 to 4 pounds.

BIRDS

Ducks

Live weight: 2.1 pounds

Conversion factor: 0.7

Edible weight: 1.5 pounds

Source: Bellrose (1976)

Comments: The live weight represents that of a pintail, one of the most commonly harvested ducks in the Kotzebue area. Because both larger (eiders, mallard) and smaller (teal, oldsquaw, shoveler) species were also taken, the pintail was assumed to be a representative species.

Geese

Live weight: 6 pounds

Conversion factor: 0.7

Edible weight: 4.2 pounds

Source: Bellrose (1976)

Comments: Live weight was calculated as the average of the white-fronted goose, Canada goose, and snow goose, which were the most commonly harvested species in the Kotzebue area.

Ptarmigan

Live weight: 1 pound

Conversion factor: 0.7

Edible weight: 0.7 pound

Source: Weeden (1978)

Comments: The live weight of a ptarmigan is estimated at .66 to 1.5 pounds.

Spruce grouse

Live weight: 1 pound

Conversion factor: 0.7

Edible weight: 0.7 pound

Source: Petersen (1961)

Comments: Spruce grouse and willow ptarmigan were estimated to be close to the same size.

Sandhill Crane

Live weight: 12 pounds

Conversion factor: 0.7

Edible weight: 8.4 pounds

Source: Bellrose (1976)

Snowy Owl

Live weight: 4 pounds

Conversion factor: 0.7

Edible weight: 2.8 pounds

Source: Burch (1985:147)

Eggs

Live weight: 3 ounces

Sources: Burch (1985:145); Georgette and Loon field research notes (1987).

Comments: The live weight represents the combined average weight of gull eggs (2.5 ounces) and murre eggs (3.5 ounces). Both were collected by Kotzebue households. The weight of the eggshell was assumed to be insignificant so no conversion factor was used.

FISH

Edible weights for fish were generally minimum estimates. Many fish were almost wholly utilized with the head, roe, liver, and other parts used for human consumption. Flounder, Pacific herring, northern

pike, salmon, sheefish, whitefish, saffron cod, longnose sucker, and rainbow smelt were often used in their entirety for dog food. Some households reported their harvest or use in terms of dried fish. These were converted to their equivalent in fresh fish.

Salmon

Live weight: 8.7 pounds

Conversion factor: 0.7

Edible weight: 6.1 pounds

Source: Alaska Department of Fish and Game (1986:75)

Comments: Live weight is the average for chum salmon in the 1986 Kotzebue Sound commercial fishery. Researchers did not differentiate between the species of salmon because chum comprised the overwhelming majority of salmon taken in Kotzebue Sound.

Sheefish

Live weight: 7.8 pounds

Conversion factor: 0.7

Edible weight: 5.5 pounds

Sources: Alaska Department of Fish and Game (1986:179); Loon field data notes (1987).

Comments: The average weight of sheefish in the preliminary results of the 1986-87 commercial sheefish fishery in Kotzebue Sound was 8.1 pounds. In spring 1987, Loon and Ken Alt of Division of Sport Fish weighed 148 sheefish caught with hook and line by subsistence fishermen on Kobuk Lake and found the average weight to be 7.5 pounds. Because Kotzebue residents harvested sheefish both with nets (represented by the commercial fishery average weight) and with hook and line, the live weight used was the average of these two numbers.

Dolly Varden

Live weight: 4.7 pounds

Conversion factor: 0.7

Edible weight: 3.3 pounds

Source: DeCicco (1985:89)

Comments: The live weight represents an average of prespawning Dolly Varden in 1983 in the Kelly, Kugururok, Nimiuktuk, and Wulik rivers in northwest Alaska.

Saffron cod

Live weight: 0.3 pound

Conversion factor: 0.7

Edible weight: 0.21 pound

Source: Mark Willette, Marine Advisory Program, Kotzebue, pers. comm., June 26, 1987.

Comments: Willette estimated the average weight of saffron cod in the Kotzebue area at 120 to 150 grams.

Whitefish species

Live weight: 2.5 pounds

Conversion factor: 0.7

Edible weight: 1.75 pounds

Source: Johnson (1986:15)

Comments: The live weight represents the mean weight of 2,775 whitefish of combined species harvested in the 1985 Selawik commercial fishery.

Northern pike

Live weight: 4.7 pounds

Conversion factor: 0.7

Edible weight: 3.3 pounds

Source: Johnson (1986:15)

Comments: The live weight represents the mean weight of 1,226 northern pike caught in the 1985 Selawik commercial fishery.

Pacific herring

Live weight: 0.26 pound

Conversion factor: 0.7

Edible weight: 0.18 pound

Source: Mark Willette, Marine Advisory Program, Kotzebue, pers. comm., June 26, 1987.

Comments: Willette's estimate of the live weight of herring (120 grams) was based on actual weights taken of herring in Kotzebue Sound.

Arctic grayling

Live weight: 1.25 pounds

Conversion factor: 0.7

Edible weight: 0.9 pounds

Source: Morrow (1980:145)

Comments: The average weight for a grayling is estimated at 1 to 1.5 pounds.

Burbot

Live weight: 6.0 pounds

Conversion factor: 0.7

Edible weight: 4.2 pounds

Sources: Johnson (1986:15); Alaska Department of Fish and Game (1986:199).

Comments: Burbot harvested in the 1985 Selawik commercial fishery had a mean weight of 7.5 pounds.

Burbot harvested in the 1986 Noatak River freshwater fish fishery had an average weight of 4.5 pounds.

Live weight represents the average of these two numbers.

Rainbow smelt

Live weight: 0.2 pounds

Conversion factor: 0.7

Edible weight: 0.14 pounds

Source: Mark Willette, Marine Advisory Program, Kotzebue, pers. comm., June 26, 1987.

Comments: Willette's estimate of the live weight of smelt (90 grams) was based on actual measurements taken of Kotzebue area smelt.

Flounder

Live weight: 1.5 pounds

Conversion factor: 0.7

Edible weight: 1.1 pounds

Source: Researchers' estimate.

Sculpin

Live weight: 0.3 pound

Conversion factor: 0.7

Edible weight: 0.21 pound

Source: Morrow (1980:207)

Comments: Morrow estimates sculpins at 0.6 pound live weight; however, this is probably too high for those harvested in the Kotzebue area. Most sculpins were caught incidentally while ice fishing for saffron cod and were similar in size to these.

Longnose sucker

Live weight: 2 pounds

Conversion factor: 0.7

Edible weight: 1.4 pounds

Source: Researchers' estimate.

Comments: Live weight of suckers harvested by Kotzebue residents was estimated to be slightly less than whitefish.

Alaska blackfish

Live weight: 0.1 pound

Conversion factor: 0.7

Edible weight: 0.07 pound

Source: Mike Coffing, Division of Subsistence, Bethel, pers. comm., July 6, 1987.

Comments: Blackfish weights vary considerably from area to area. The one household that harvested blackfish did so on the Yukon-Kuskokwim Delta, so a live weight from the Bethel area was used.

Clams

Live weight: 0.36 pound

Conversion factor: 0.375

Edible weight: 0.13 pound

Source: Nelson (1983) as cited in Stratton and Georgette (1984:210)

Crab

Live weight: 3 pounds

Conversion factor: 0.7

Edible weight: 2.1 pounds

Source: Jim Magdanz, Division of Subsistence, Kotzebue, pers. comm., May 1987.

Comments: Most crab used by Kotzebue residents came from the Nome area and were therefore assumed to be red or blue king crab. Kotzebue residents commonly ate both the crab meat and viscera.

BERRIES AND PLANTS

Respondents commonly reported harvests of plant products in quarts, gallons, "ziplock" bags, trash bags, and barrels. Using Burch (1985:152) and information from key respondents, researchers made the following weight assumptions.

Berries

One gallon = 6.5 pounds

One bag or "ziplock" bag = one gallon

One "Alaska Commercial" bag = 2 gallons

One bucket = 2 gallons

One barrel = 60 pounds

Greens

One gallon (dry) = 1 pound (cooked)

One bag or "ziplock" bag = one gallon

One bucket (dry) = 2 gallons (dry)

One "Alaska Commercial" bag (dry) = 2 gallons (dry)

One gunnysack or trash bag (dry) = 17 pounds (cooked)

Roots

One "ziplock" bag = 4 pounds

One "Alaska Commercial" bag = 8 pounds

One sack = 8 pounds

MISCELLANEOUS EQUIVALENTS

Many households reported their harvest and use of wild food in other than standard western measures of volume and weight. With the help of key respondents, the following assumptions were made concerning these measurements.

Fish

Species most commonly measured in the following units were Pacific herring, rainbow smelt, saffron cod, sucker, and whitefish species, and occasionally Dolly Varden, northern pike, and flounder. The following weights represent that of fresh fish. Using these weights, researchers calculated the number of fish, then converted that to edible pounds using the appropriate conversion factor.

One "Alaska Commercial" bag = 15 pounds

One box = 30 pounds

One 5-gallon bucket = 30 pounds

One trash bag = 60 pounds

One "big" box = 85 pounds

One gunnysack = 100 pounds

One tub = 125 pounds

One drum = 350 pounds

One string of pike = 6 fish

One string of whitefish = 8 fish

Marine Mammals

One box = 30 pounds

One "big" block = 30 pounds

One 5-gallon bucket of seal oil without meat = 38 pounds

One 5-gallon bucket of seal oil with meat = 40 pounds

One can of seal oil = 3 quarts

One bucket of seal oil = 2 gallons

One barrel of seal oil = 20 gallons

Eggs

One gallon = 32 eggs

One tub = 30 gallons

APPENDIX 3.
STRATIFICATION INSTRUMENT

KOTZEBUE SUBSISTENCE SURVEY

My name is _____. I'm working for Subsistence Division on a study of subsistence use in Kotzebue. We've been going to all the houses in town trying to get an idea of how much subsistence foods are used by Kotzebue families. This information will be used to show the importance of subsistence in Kotzebue. Later next month we will be doing more detailed interviews on subsistence with a few randomly selected households in Kotzebue. Your participation is voluntary.

It would help us to know if your household (the people living in this house) takes a large, medium, or small amount of subsistence foods.

1. SINCE NOVEMBER OF LAST YEAR, DID YOUR HOUSEHOLD CATCH MORE THAN TEN CARIBOU, MORE THAN TEN SEALS, OR MORE THAN 1,000 POUNDS OF FISH? (Do not include commercial fish.)

If yes, check high harvest.

If no, then ask:

SINCE NOVEMBER OF LAST YEAR, DID YOUR HOUSEHOLD CATCH MORE THAN 500 POUNDS OF SUBSISTENCE FOODS?

If yes, check medium harvest.

If no, check low harvest.

2. SO THAT WE CAN UPDATE THE CITY CENSUS AND KEEP TRACK OF WHO WE'VE TALKED TO, IT WOULD HELP US TO KNOW:

HOW MANY PEOPLE LIVE IN THIS HOUSE? (Include people who live here but are temporarily away)

WHAT IS YOUR HOUSE NUMBER?

WHO IS THE HEAD OF THIS HOUSEHOLD?

APPENDIX 4.

DEFINITION OF EMPLOYMENT CATEGORIES

MINING

- Metal Mining
- Coal Mining
- Oil & Gas Extraction
- Nonmetallic Minerals excluding Fuels

CONSTRUCTION

- General Building Contractors
- Heavy Construction Contractors excluding Building
- Special Trade Contractors

MANUFACTURING

- Food & Kindred Products
- Textile Mill Products
- Apparel & Other Textile Products
- Lumber & Wood Products
- Furniture & Fixtures
- Paper & Allied Products
- Printing & Publishing
- Chemicals & Allied Products
- Petroleum & Coal Products
- Rubber & Misc. Plastics Products
- Leather & Leather Products
- Stone, Clay & Glass Products
- Primary Metal Industries
- Fabricated Metal Products
- Industrial Machinery & Equipment
- Electronic & Other Electric Equipment
- Transportation Equipment
- Instruments & Related Products
- Miscellaneous Manufacturing Industries

TRANSPORTATION, COMMUNICATION & UTILITIES

- Railroad Transportation
- Local & Interurban Passenger Transit
- Trucking & Warehousing
- Water Transportation
- Pipelines excluding Natural Gas
- Transportation Services
- Communication
- Electric, Gas & Sanitary Services

TRADE

- Building Materials & Garden Supplies
- General Merchandise Stores
- Food Stores
- Automotive Dealers & Service Stations
- Apparel & Accessory Stores
- Furniture & Home Furnishings Stores
- Eating & Drinking Places
- Miscellaneous Retail

FINANCE, INSURANCE & REAL ESTATE

- Depository Institutions
- Nondepository Institutions
- Security & Commodity Brokers
- Insurance Carriers
- Insurance Agents, Brokers & Service
- Real Estate
- Holding & Other Investment Offices

SERVICES

- Hotels & Other Lodging
- Personal Services
- Business Services
- Auto Repair, Services & Parking
- Miscellaneous Repair Services
- Motion Pictures
- Amusement & Recreation Services
- Health Services
- Legal Services
- Education Services
- Social Services
- Museums, Botanical, Zoological Gardens
- Membership Organizations
- Engineering & Management Services
- Private Households
- Miscellaneous Services

FEDERAL GOVERNMENT

STATE GOVERNMENT

LOCAL GOVERNMENT

- Administration
- Education

COMMERCIAL FISHING

APPENDIX 5.

COMMON, SCIENTIFIC, AND IÑUPIAQ NAMES OF COMMONLY USED WILD
FOODS IN THE KOTZEBUE AREA

Common name	Scientific name	Iñupiaq name
Caribou	<i>Rangifer tarandus</i>	Tuttu
Moose	<i>Alces alces</i>	Tiniikaq
Dall sheep	<i>Ovis dalli</i>	Ipniaq
Brown bear	<i>Ursus arctos</i>	Aktaq
Black bear	<i>Ursus americanus</i>	Iyyaǵriq
Bearded seal	<i>Erignathus barbatus</i>	Ugruk
Ringed seal	<i>Phoca hispida</i>	Natchiq
Beluga	<i>Delphinapterus leucas</i>	Sisuaq
Spotted seal	<i>Phoca largha</i>	Qasigiaq
Ribbon seal	<i>Phoca fasciata</i>	Qiaǵutlik
Walrus	<i>Odobenus rosmarus divergens</i>	Aiviq
Polar bear	<i>Ursus maritimus</i>	Nanuuq
Bowhead whale	<i>Balaena mysticetus</i>	Aǵviq
Porcupine	<i>Erethizon dorsatum</i>	Iluqutaq
Beaver	<i>Castor canadensis</i>	Paḷuqtaq
Arctic fox	<i>Alopex lagopus</i>	Qusrhaaq
Red fox	<i>Vulpes fulva</i>	Kayuqtuuq
Arctic hare	<i>Lepus othus</i>	Ukallisugruk
Snowshoe hare	<i>Lepus americanus</i>	Ukallaitchak
Lynx	<i>Lynx canadensis</i>	Niitviq
Land otter	<i>Lutra canadensis</i>	Pamiuqtuuq
Muskrat	<i>Ondatra zibethica</i>	Kigvaluk
Marten	<i>Martes americana</i>	Qapvaitchiaq
Mink	<i>Mustela vison</i>	Tiǵiaqpak
Arctic ground squirrel	<i>Citellus parryi</i>	Siksrik
Weasel, ermine	<i>Mustela erminea</i>	Tiǵiaq
Wolf	<i>Canis lupus</i>	Amaǵuq
Wolverine	<i>Gulo gulo</i>	Qapvik
Ducks		Tiḡmiǵruich
Northern pintail	<i>Anas acuta</i>	Kuruǵaq
Mallard	<i>Anas platyrhynchos</i>	Kuruǵasugruk
Green-winged teal	<i>Anas crecca</i>	Qaiḡḡiq
American wigeon	<i>Anas americana</i>	Uǵiiqhiq
Northern shoveler	<i>Anas clypeata</i>	Aluutaq
Oldsquaw	<i>Clangula hyemalis</i>	Ahaaliq
Greater scaup	<i>Aythya marila</i>	Qaqḡutuuq
Common eider	<i>Somateria mollissima</i>	Mitiq
Black scoter	<i>Melanitta nigra</i>	Tuunǵaǵruk
Geese		Liǵliq
White-fronted goose	<i>Anser albifrons</i>	Kiǵiyuk
Canada goose	<i>Branta canadensis</i>	Iqsraǵutilik
Snow goose	<i>Chen caerulescens</i>	Kaḡuq
Brant	<i>Branta bernicla</i>	Niǵliǵnauraq

APPENDIX 5 -- CONTINUED

Common name	Scientific name	Iñupiaq name
Willow ptarmigan	<i>Lagopus lagopus</i>	<i>Aqargiq</i>
Spruce grouse	<i>Dendragapus canadensis</i>	<i>Napaaqtum aqargiq</i>
Sandhill crane	<i>Grus canadensis</i>	<i>Tattirgaq</i>
Snowy owl	<i>Nyctea scandiaca</i>	<i>Ukpik</i>
Tundra swan	<i>Cygnus columbianus</i>	<i>Qugruk</i>
Eggs		<i>Manniich</i>
Chum salmon	<i>Oncorhynchus keta</i>	<i>Qalugruaq</i>
Sheefish	<i>Stenodus leucichthys</i>	<i>Sii</i>
Dolly Varden, trout	<i>Salvelinus malma</i>	<i>Iqalukpik</i>
Saffron cod, tomcod	<i>Eleginus gracilis</i>	<i>Uugaq</i>
Northern pike	<i>Esox lucius</i>	<i>Siulik</i>
Burbot, mud shark	<i>Lota lota</i>	<i>Tiktaaliq</i>
Arctic grayling	<i>Thymallus arcticus</i>	<i>Sulukpaugaq</i>
Pacific herring	<i>Clupea harengus pallasii</i>	<i>Uqsruqtuuq</i>
Whitefish	<i>Coregonus sp.</i>	<i>Iqalupiaq</i>
Alaska whitefish	<i>Coregonus nelsoni</i>	<i>Qaaligiq</i>
Least cisco	<i>Coregonus sardinella</i>	<i>Iqalusaaq</i>
Bering cisco	<i>Coregonus laurettae</i>	<i>Tipuk</i>
Broad whitefish	<i>Coregonus nasus</i>	<i>Sigguilaq</i>
Rainbow smelt	<i>Osmerus mordax</i>	<i>Ithuañniq</i>
Arctic cod, blue cod	<i>Boreogadus saida</i>	<i>Qalauq</i>
Starry flounder	<i>Liopsetta glacialis</i>	<i>Ipnaqñailiaq</i>
Arctic flounder	<i>Platichthys stellatus</i>	<i>Nataaḡnaq</i>
Longnose sucker	<i>Catostomus catostomus</i>	<i>Milugiaq</i>
Slimy sculpin, bullhead	<i>Cottus cognatus</i>	<i>Kanayug</i>
Fourhorn sculpin, bullhead	<i>Myoxocephalus quadricornis</i>	<i>Kanayug</i>
Nine-spine stickleback	<i>Pungitius pungitius</i>	<i>Kakilisaq</i>
Alaska blackfish	<i>Dallia pectoralis</i>	<i>Ithuiqñiq</i>
King crab	<i>Paralithodes camtschatica</i>	<i>Putyugiat</i>
Clams	<i>Spisula polynyma</i>	<i>Uviiuq</i>
Mussels	<i>Mytilus edulis</i>	<i>Avyaq</i>
Berries		<i>Asriat</i>
Salmonberry, cloudberry	<i>Rubus chamaemorus</i>	<i>Aqpik</i>
Blueberry	<i>Vaccinium uliginosum</i>	<i>Asriavik</i>
Lowbush cranberry	<i>Vaccinium vitis idaea</i>	<i>Kikmiññaq</i>
Blackberry, crowberry	<i>Empetrum nigrum</i>	<i>Paunḡaq</i>
Sourdock	<i>Rumex arcticus</i>	<i>Quaqaq</i>
Wild rhubarb	<i>Polygonum alaskanum</i>	<i>Qusimmaq</i>
Willow leaves	<i>Salix pulchra</i>	<i>Surat</i>
Labrador tea	<i>Ledum palustre</i>	<i>Tilaaqqii</i>
Eskimo potato	<i>Hedysarum alpinum</i>	<i>Masu</i>
Cotton grass	<i>Eriophorum angustifolium</i>	<i>Pikniq</i>

Note: Iñupiaq orthography follows that developed in 1948 by Roy Amaogak and Eugene Nida and used widely in northwest Alaska since the 1970s.

