# Subsistence Fisheries Alaskan Arctic, 1970-1986

## Social and Economic Studies

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# SUBSISTENCE FISHERIES AT COASTAL VILLAGES IN THE ALASKAN ARCTIC, 1970-1986

PREPARED FOR

MINERALS MANAGEMENT SERVICE
ALASKA OUTER CONTINENTAL SHELF REGION
LEASING AND ENVIRONMENT OFFICE

PREPARED BY

PETER C. CRAIG
LGL ECOLOGICAL RESEARCH ASSSOCIATES, INC.

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ABSTRACT

Subsistence fisheries in the Alaskan Arctic provide an important food source for the coastal communities of Barrow, Point Lay, Wainwright, Atqasuk, Nuiqsut, and Kaktovik. The total annual harvest (villages combined) is roughly 210,000 lb of fish, which in terms of utilizable weight almost equals the villages' annual harvest of bowhead whales.

The fisheries concentrate on anadromous species (whitefish, char, salmon) although freshwater species (grayling) are also taken. The species caught at each village differ, as would be expected based on distribution patterns of fishes in the study area. The fisheries are fairly well-described in terms of timing and location but not harvest quantity. In some cases, the only available information about harvest quantity consists of a rough estimate made 15 years ago.

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## INTRODUCTION

Fish historically have been a vital food source for the Inupiat of the Alaskan Arctic. In modern times, fishing continues to be an important activity despite the rapid cultural and economic changes brought about since 1970 by the discovery and development of the North Slope oil fields. Fully one third of the adult population in North Slope communities participated in fishing activities in 1977-78 (Fig. 1).

The period covered in this report, 1970-1986, represents a time of transition of cultural values and patterns of subsistence use. Documentation of subsistence fisheries has been sparse, however, with most available reports describing fishing only in general terms and often from a cultural perspective. There are f'ew detailed accounts of actual quantities of fish harvested, and the information that is available is not generally known for two reasons: the data occur in widely scattered reports by government agencies and private firms, and people interested in subsistence information are often unaware that pertinent information may be "hidden" in the occasional. scientific fish report.

The overall objective of the present report is therefore to assemble the available information and assess the current state of knowledge about modern subsistence fisheries at North Slope communities. The report focuses on the fish and fisheries themselves i.e., what species are caught, how many, where and when. This focus specifically precludes an analysis of the cultural or economic significance of the fisheries--these topics are described by others (e.g., Nielson 1977, NSB 1979a, Kruse et al. 1981, Jacobson and Wentworth 1982, Braund and Burnham 1984, Galginaitis et al. 1984, Alaska Consultants et al. 1984, Stern 1985).

## METHODS

The study area is the North Slope of Alaska, from Point Lay to the U.S.-Canada border on the Beaufort Sea (Fig. 2). Subsistence fisheries are examined at six coastal villages:

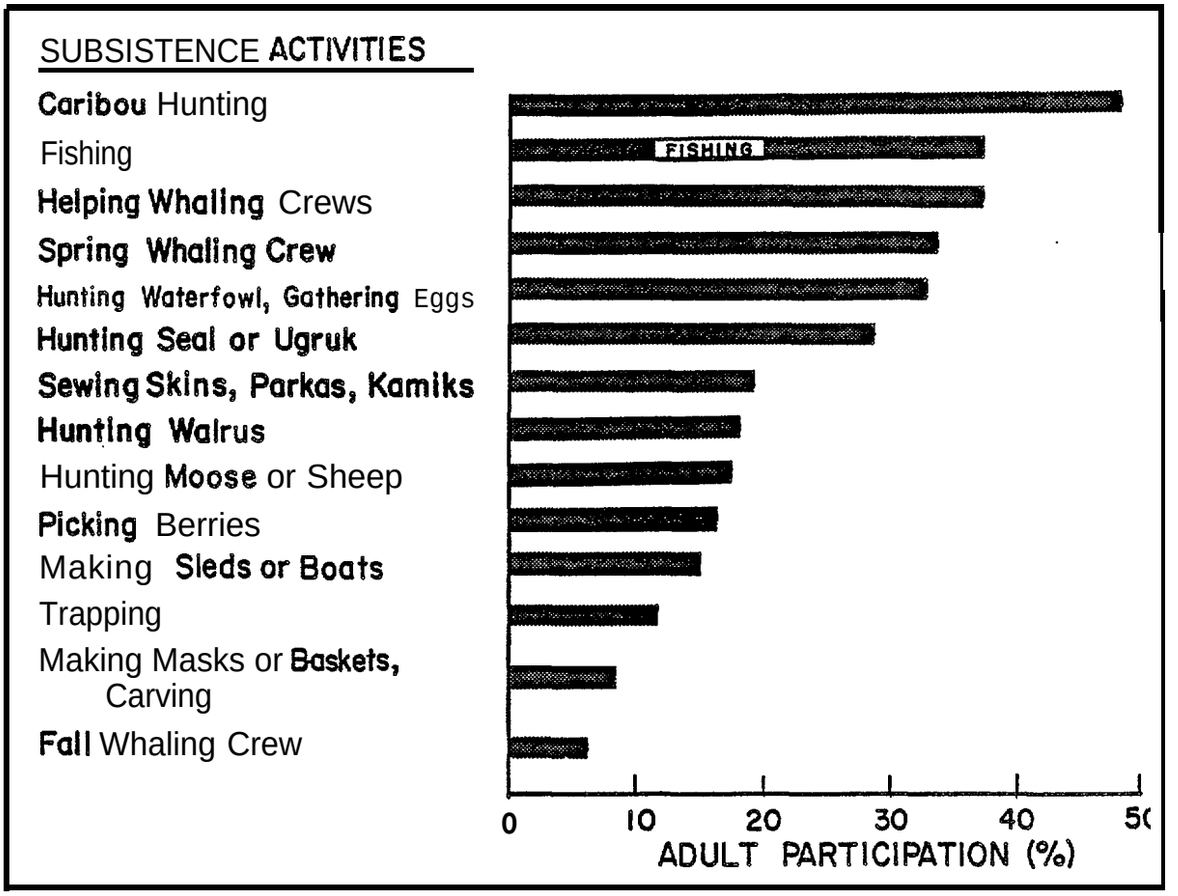


Figure 1. Proportion of adults from North Slope communities who participated in various subsistence activities in 1977-78. The sample size was 290 adults from the villages of Point Hope, Wainwright, Barrow, Nuiqsut, Kaktovik, and Anaktuvuk Pass. Redrawn from Kruse et al. 1981.

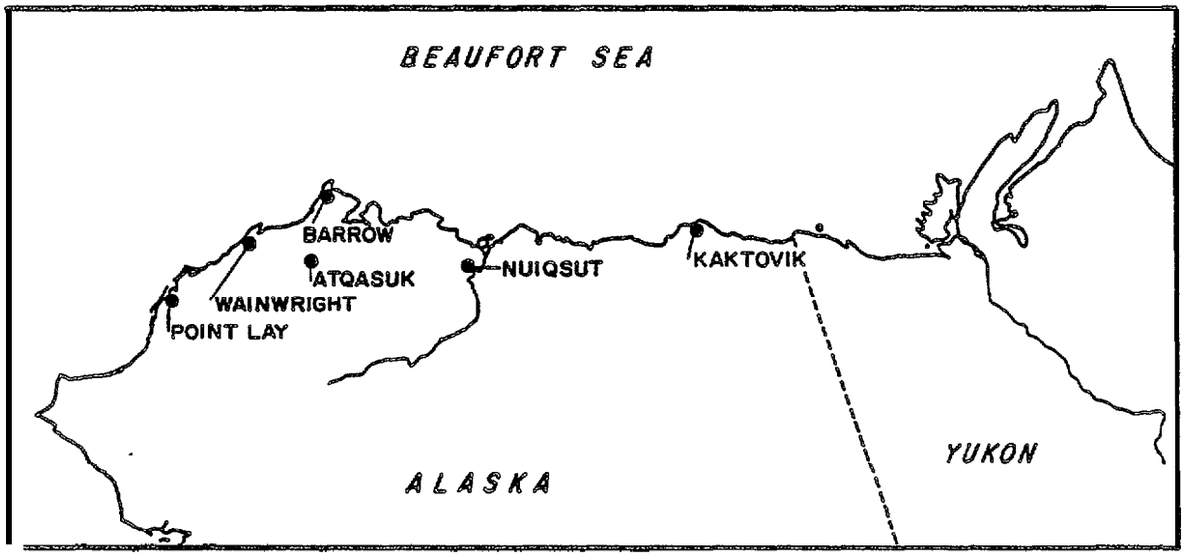


Figure 2. North. Slope communities.

| | |
|---|---|
| Point Lay | Atqasuk |
| Wainwright | Nuiqsut |
| Barrow | Kakt ovik |

This report is based on a Literature review and on discussions with people familiar with fish research conducted in the study area (see Acknowledgements]. The intent was to collect fisheries information, particularly to search for "hard data" describing actual quantities of fish harvested. Original data have therefore been emphasized. The literature search included many pre-1970 documents in addition to post-1970 reports (e.g., Murdock 1884, Bean 1887, Hewes 1947, MacGinitie 1955, Sonnefeld 1956, Wilimovsky 1956, Milan 1958 and 1964, Spencer 1959, Foote 1965, Bane 1966, Hanson et al. 1966, Nelson 1966 and 1969, Andersen 1982). However, only one pre-1970 report contained the kinds of quantitative data useful for this report.

In this report, the term 'subsistence fishery" is used in its broadest sense, i.e., the personal use of locally-caught fish for food. Some fish, however, are traded or sold to other villagers, but the degree to which this occurs is not known and therefore these fish are considered to be part of the subsistence catch.

This report concentrates on fishing areas of known and often traditional importance, but it is recognized that, in addition, people may catch fish for their immediate consumption wherever they travel or hunt, which may include the entire North Slope when the subsistence-use areas of all the villages are viewed in total (Fig. 3).

The standardized unit of fish harvest used in this report is the total weight of the catch. Weights originally expressed as "dressed weights" have been converted to total weight according to the conversion factors used by the authors. Differences between total and dressed weights (about 20%) are not particularly significant given the imprecise methods used to approximate annual harvests in all studies.

Population sizes of the North Slope communities were obtained from Kruse et al. (1981) and the Alaska Department of Community and Regional Affairs (FY 1986 Revenue Sharing Program).

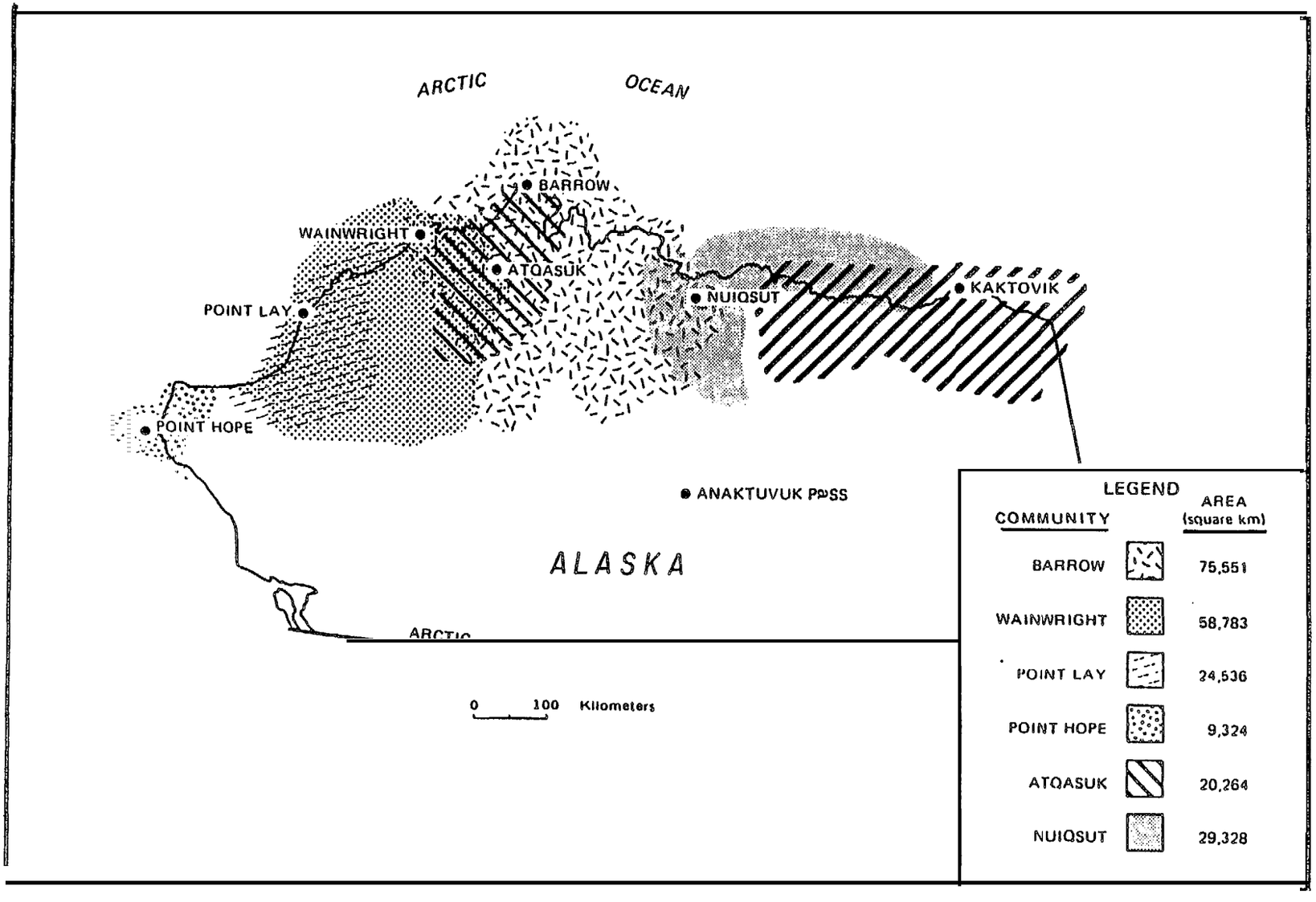


Figure 3. Subsistence-use areas for al resources used by each North Slope Village. Source: Pedersen 1979.

## THE FISHES

Subsistence fishermen catch a variety of species in arctic waters (Table 1), but not all of these species are of equal value--some are discarded and others are not equally abundant throughout the study area. The principal species harvested thus differ among the villages (Table 2).

Two features of' the environment influence fish distributions in the study area and thus determine the kinds of fishes that are available to the various fisheries (Craig 1984a,b):

1. Proximity to Bering Sea. The Chukchi Sea is a transition zone between the warmer, productive waters of the Bering Sea and the colder, less productive waters of the Beaufort Sea. Some southern species such as salmon and herring range northward into the northeastern Chukchi Sea but are scarce in the Beaufort Sea. Salmon are thus more common in subsistence harvests at Point Lay, Wainwright and Barrow than at villages along the Beaufort coast.

2. Locations of Anadromous Fish Streams. When anadromous fish enter the coastal waters of the study area, many do not range far from their natal rivers. Thus, the species composition and abundance of anadromous species in coastal waters generally reflect the proximity of the rivers from which the fish came. In this respect, the study area can be divided into three coastal regions with different fish species composition as illustrated in Figure 4.

   First, streams in the Chukchi region (Point Hope to Barrow) are generally small and of marginal significance for the production of anadromous fishes. The relatively few anadromous fishes produced in this region (notably salmon) contribute to the subsistence fisheries at Point Lay, Wainwright, and Barrow.

   Second, streams in the central part of the study area (Barrow to the Colville River) produce primarily

Table 1. List of commonly caught fishes in the study area.

| Common Name | Scientific Name | Inupiat Name[1] | Weight (lb)[2] |
|---|---|---|---|
| **Anadromous Species** | | | |
| Chum salmon | Oncorhynchus keta | iqalugruaq, iqaluruaq | 6.0-9.0 |
| Pink salmon | O. gorbuscha | amaqtuq | 2.0-3.1 |
| Arctic char | Salvelinus alpinus | iqalukpik | 0.9-4.0 |
| Whitefish | | | |
| Broad whitefish | Coregonus nasus | aanaakliq, aanaaliq | 1.2-3.9 |
| Humpback whitefish | C. clupeaformis | pikuktuuq | 1.4-203 |
| Arctic cisco | C. autumnalis | qaaktaq, qaatag | 0.8-2.0 |
| Least cisco | C. sardinella | iqalusaaq | 0.5-0.9 |
| Bering cisco | C. laurettae | qaaktaq, tipuk | 1.1-2.2 |
| Rainbow smelt | Osmerus mordax | ilhuagniq | 0.15-0.25 |
| **Marine Species** | | | |
| Pacific herring | Clupea harengus | uqsruqtuuq | 0.3-0.4 |
| Arctic cod (tomcod) | Boreogadus saida | iqalugaq, uugaq | 0.05-0.13 |
| Saffron cod (tomcod) | Eleginus gracilis | uugaq | 0.06-0.31 |
| Capelin | Mallotus villosus | panmaksraq, panmagriq | 0.02-0.04 |
| Fourhorn sculpin | Myoxocephalus quadricornis | kanayuq | |
| Arctic flounder | Liopsetta glacialis | nataagnaq, puyyaqiaq | |
| **Freshwater Species** | | | |
| Arctic grayling | Thymallus arcticus | sulukpaugaq | 0.3-1.7 |
| Lake trout | Salvelinus namaycush | igalukpak | 2.7-14.4 |
| Burbot (lingcod) | Lota lota | tittaaliq | 2.0-10.0 |
| Round whitefish | Prosopium cylindraceum | savigunaq, aanaaliq | 0.5-0.9 |

[1]Sources: Schneider et al. 1980, Nelson 1981, Jacobson and Wentworth 1982, Pedersen et al. 1985, Stern 1985, George and Nageak 1986.

[2]Typical whole weight of subsistence-caught fish.

Table 2. Primary species of fishes harvested at North Slope villages.

| Village | Primary Fish Species Harvested | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Herring | Salmon | Rainbow smelt | White-fish | Least cisco | Arctic[1] cisco | Arctic char | Grayling |
| Point Lay | + | + | | | | | | + |
| Wainwright | | + | + | | | | | + |
| Barrow | | + | | + | + | + | | |
| Atqasuk | | | | + | + | | | + |
| Nuiqsut | | | | + | + | + | + | + |
| Kaktovik | | | | | | + | + | |

[1]Arctic or Bering cisco.

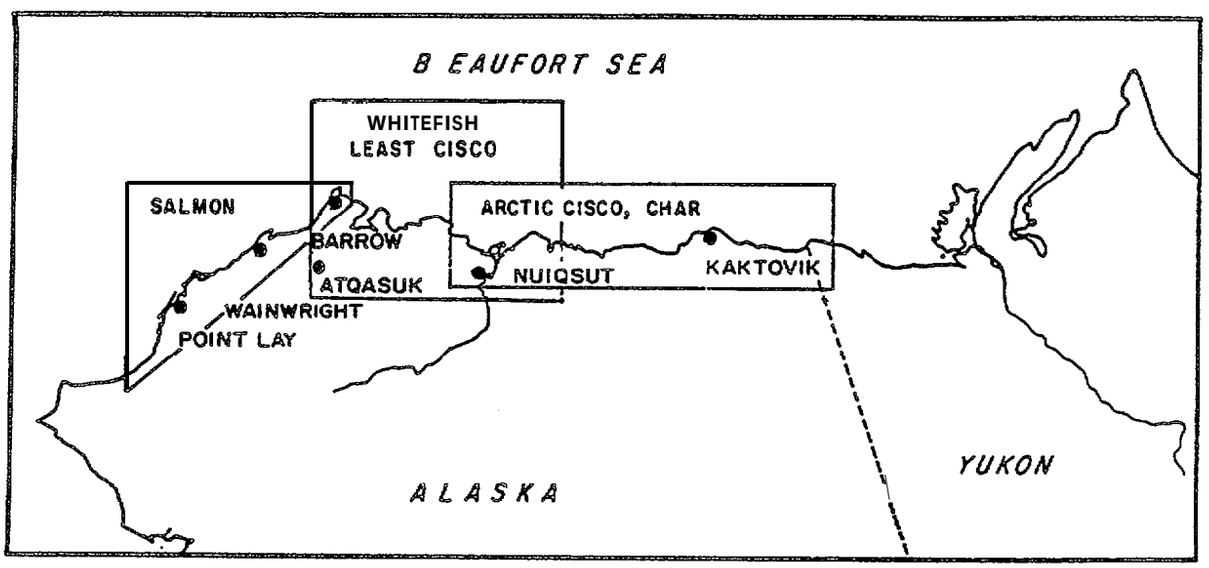


Figure 4. Principal anadromous fish species harvested by coastal region.

whitefishes and ciscoes which are prominent in the subsistence harvests at Barrow, Atqasuk, and Nuiqsut.

Third, streams in the eastern portion of the study area (Colville to the Mackenzie rivers) produce primarily arctic char. These char, together with migrant arctic cisco from the Mackenzie River, constitute most of the subsistence catch at Kaktovik.

Though fish populations are distributed generally in accordance with these patterns, individual fish may disperse farther along the coastline. For example, fish tagged in Simpson Lagoon (Fig. 5) and Prudhoe Bay have been recovered from Barrow to the Mackenzie River.

General distribution patterns of' the commonly-harvested species are described below.

## Anadromous Species

Anadromous species, whose life cycle includes both a freshwater and a marine phase, constitute by far the largest portion of subsistence harvests at North Slope villages. The principal anadromous species caught are salmon, arctic char, whitefishes, ciscoes, and rainbow smelt.

### Salmon

Pacific salmon, though not very abundant in arctic waters (reviewed by Craig and Haldorson 1985), are most common along the coastline of the northeastern Chukchi Sea (Fig. 6). Only pink (humpback) and chum (dog) salmon occur with any regularity in the study area. Pink salmon are the most common species, accounting for 85% of all salmon caught in biological surveys from 1970 to 1984, followed by chum salmon (13%). "Silver salmon" are also caught, but this is a generic term which may be applied by subsistence fishermen to sea-run salmon of any species.

Small runs of pink salmon occur in several streams between Point Hope and Barrow, and perhaps in the Colville River. Their abundance in the study area is highly variable both seasonally and annually. Pink salmon display a cyclical pattern of abundance--they are much more abundant in

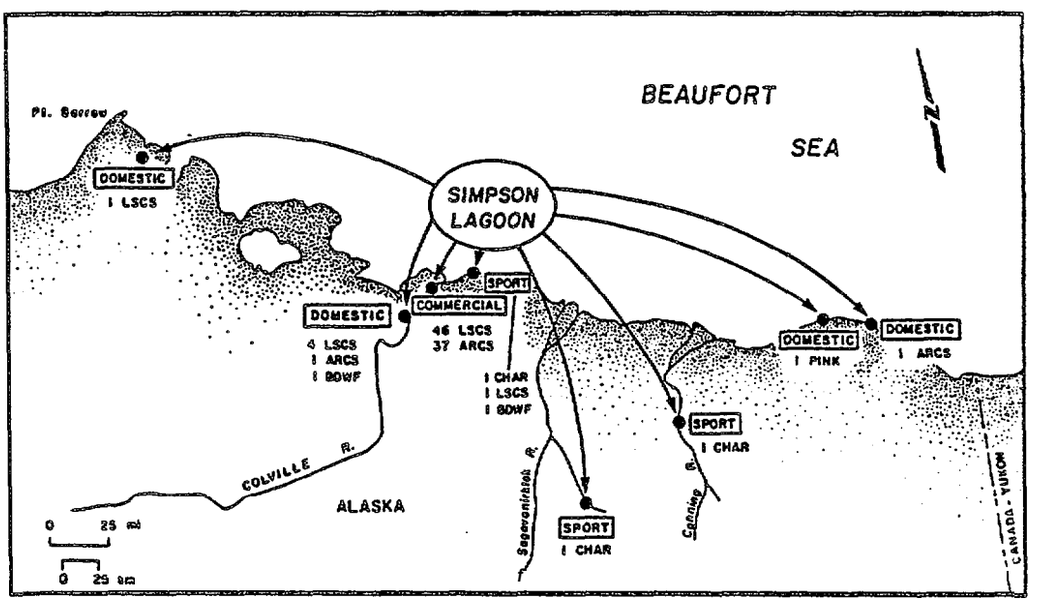


Figure 5. Fish tagged in Simpson Lagoon and recaptured in commercial, domestic or sport fisheries. Specific mark and recapture data are listed in Appendix 1. Abbreviations: ARCS (Arctic cisco), LSCS (least cisco), CHAR (Arctic char), BDWF (broad whitefish), PINK (pink salmon). Source: Craig and Haldorson 1981.

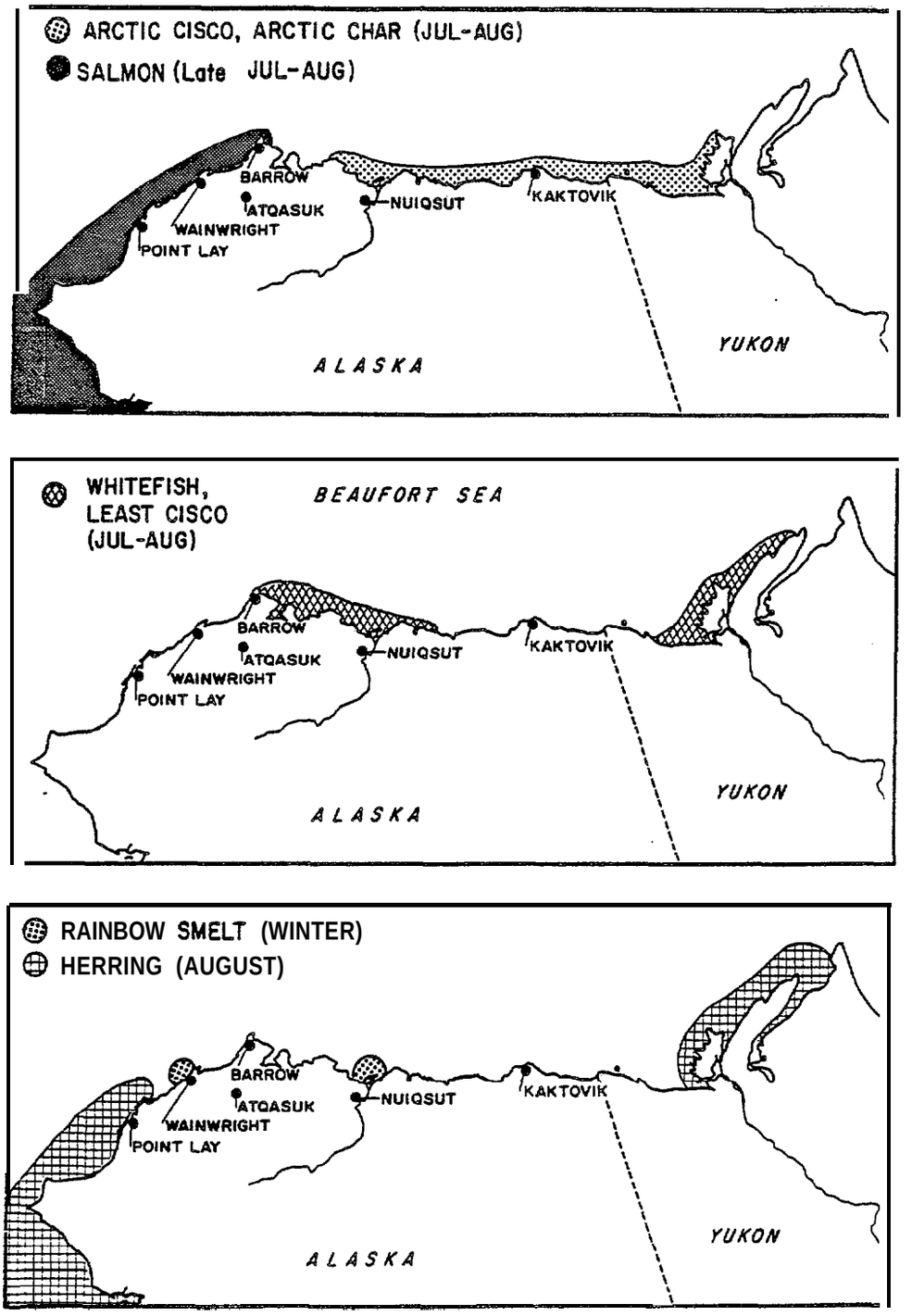


Figure 6. Coastal regions where anadromous fishes are most abundant (distribution limits would be greater than shown, however).

even-numbered years than odd-numbered years, as is the general pattern for this species in western Alaska (Heard 1986). Their run timing in coastal waters usually extends from the last week in July through August, with peak numbers occurring during the first half of August.

Chum salmon are not often caught east of Point Barrow, although there isa small population that spawns in the Mackenzie River (McLeod and O'Neil 1983).

### Arctic Char

In the study area, char are most abundant between the Colville and Mackenzie rivers (Fig. 6) which accounts for their prominence in subsistence catches at Kaktovik. They are usually harvested in coastal waters from late June to September, but they are also caught at traditional inland fishing sites on the Hulahula River in fall and winter.

While in coastal waters, char range east and west along the Beaufort Sea coastline and thus individual stocks become mixed. Tagging studies have shown, for example, that char caught at Kaktovik originated from several North Slope rivers (Sagavanirktok, Canning, and Firth rivers). Thus, the summer harvest of char from coastal waters distributes the fishing pressure among several stocks, whereas fishing in the Hulahula River focuses the pressure on a single small stock.

### Arctic Cisco

The arctic cisco, a favored food fish because of its fatness, is harvested primarily at Kaktovik and Nuiqsut. The coastal distribution of this species is similar to that of char (Fig. 6), but the sources of the two species differ. There are no known spawning areas for the arctic cisco in Alaska, so it is thought that the arctic cisco in the study area originate in the Mackenzie River (Gallaway et al. 1983). These authors suggest that a portion of the Mackenzie population migrates into Alaskan waters as juveniles and then remains for several years in the vicinity of the Colville River before returning to the Mackenzie River to spawn. Nuiqsut fishermen catch these arctic cisco in fall when the fish gather in

the Colville River to overwinter, and Kaktovik fishermen catch them as they migrate back to the Mackenzie in summer.

The number of arctic cisco available to these fisheries is presumably directly dependent on the number of juveniles that migrate into Alaskan waters from the Mackenzie River (Gallaway and Gazey 1987, Moulton et al. 1986). This has important ramifications for the fisheries--low recruitment from the Mackenzie leads to low harvests in Alaska several years later when the fish have grown large enough to be caught. Such fluctuations are reflected in the highly variable catch-per-unit-effort for arctic cisco in Helmericks' commercial fishery in the Colville River delta (Fig. 7).

### Other Anadromous Species

The rainbow smelt lives most of its life in marine waters but enters rivers in springtime to spawn. In winter these fish gather in Wainwright Inlet (lower Kuk River) where they are harvested by fishermen from Wainwright (Fig. 6). Smelt also congregate off the mouth of the Colville River in winter (Haldorson and Craig 1984), but there is no fishery for them there.

Other anadromous species important in subsistence catches are whitefishes (broad, humpback) and least cisco. These species do not disperse far in coastal waters (compared to arctic cisco and char) and are therefore most abundant near their rivers of origin. Large numbers are caught at Barrow, Atqasuk, and Nuiqsut in summer and fall.

The Bering cisco also occurs in coastal waters between Barrow and the Colville River (McPhail 1966, Craig and Haldorson 1981). This species is not abundant in the study area and is often confused with the arctic cisco because the two species look alike.

## Marine Species

Relatively few marine fishes are harvested for several reasons: (1) marine species are generally small fish which yield relatively little meat for the effort expended, (2) some of the most common marine species (fourhorn sculpin, arctic flounder) are not desired tablefare, and (3) the

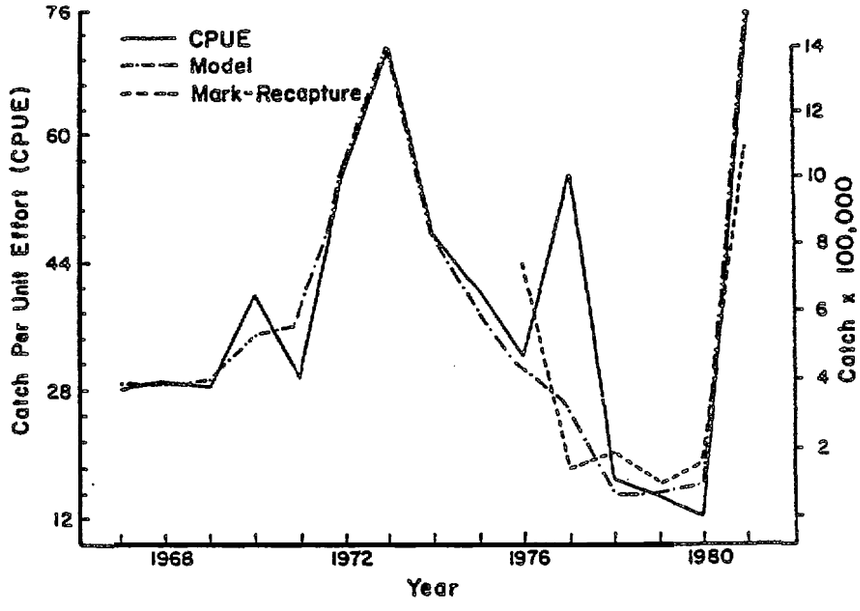


Figure 7. Population trends of Arctic cisco in the Colville delta commercial fishery (Helmericks) based on CPUE, model and mark-recapture data. Source: Gallaway et al. 1983.

marine species that are eaten (arctic cod, saffron cod) are too small to be caught by the principal fishing gear used (gillnets).

Arctic and saffron cod occur in marine waters throughout the study area. They are caught in winter by jigging a lure through the ice, but current fishing efforts are apparently less than occurred in the past.

Pacific herring are not abundant in the study area. Small populations occur along the northeastern Chukchi Sea coastline and near the Mackenzie River (Fig. 6). In the Point Lay area, herring are most abundant in August. (Note that the term 'herring" may also be used by fishermen to refer to least cisco and perhaps to other juvenile whitefish.]

Relatively small numbers of capelin occur along the northeastern Chukchi Sea coast. These small fish are briefly abundant in the Point Lay area during the first week of August when they spawn along shorelines. Capelin are less abundant along the Beaufort Sea coastline, although large spawning runs occur occasionally. McAllister (1962) recorded such an event at Herschel Island during the last week of July, 1960, but this has not been observed in recent years along the Beaufort coastline.

Fourhorn sculpin are often caught by subsistence fishermen, but these fish are an unwelcome catch because their sharp spines and "horns" are difficult to untangle from gillnets and because there is little edible reward for doing so. Some sculpins were eaten by villagers in the distant past, but today these fish are discarded.

## Freshwater Species

The arctic grayling is the principal freshwater fish caught on the North Slope. It is widely distributed and abundant in streams and lakes. Many are caught in subsistence fisheries in the Kukpowruk River by Point Lay fishermen and in the Meade Riverby Atqasuk fishermen; more are caught incidentally during other subsistence or recreational activities.

Burbot, lake trout and other freshwater species are also caught, but less frequently than grayling.

## SUBSISTENCE FISHERIES

Subsistence fishing in arctic Alaska occurs throughout the study area (Figs. 8 and 9). Most fishing occurs near the villages but some also occurs away from the villages at traditional fish camps.

Fishing consists primarily of gillnetting for anadromous fishes during the open-water season and also later in fall when gillnets can be safely set under the ice (Fig. 10); lesser numbers of fish are also caught by angling in summer and by jigging a lure through the ice in winter. Gillnets are usually set adjacent to shorelines because fish catches are generally highest there. A motorized skiff is used to reach most gillnet sites, and nets are checked at about daily intervals. Fish caught are either cooked fresh or stored by freezing or drying. In modern times, most of the fish catch on the North Slope is for human consumption rather than for dog food.

As previously described, the species harvested differ according to the location of each village (Table 2) and the uneven distributions of anadromous fishes in the study area (Fig. 4). In addition, freshwater fishes are taken in inland areas, and marine fishes are occasionally caught in coastal fisheries. Invertebrates are rarely collected.

The following sections summarize information about contemporary subsistence fisheries at each village. While a number of reports describe fishing activities, few provide quantitative estimates of annual fish harvests. Locations and years for which such quantitative data are available are as follows:

| | |
|---|---|
| Point Lay | 1983 |
| Wainwright | 1973 |
| Barrow | 1973 |
| Atqasuk | 1983 |
| Nuiqsut | 1985, 1986 |
| Kaktovik | 1973, 1975, 1985 |

Some partial estimates of harvests are also available for Barrow (1962, 1986), Nuiqsut (1984, 1985, 1986), and Kaktovik (1985).

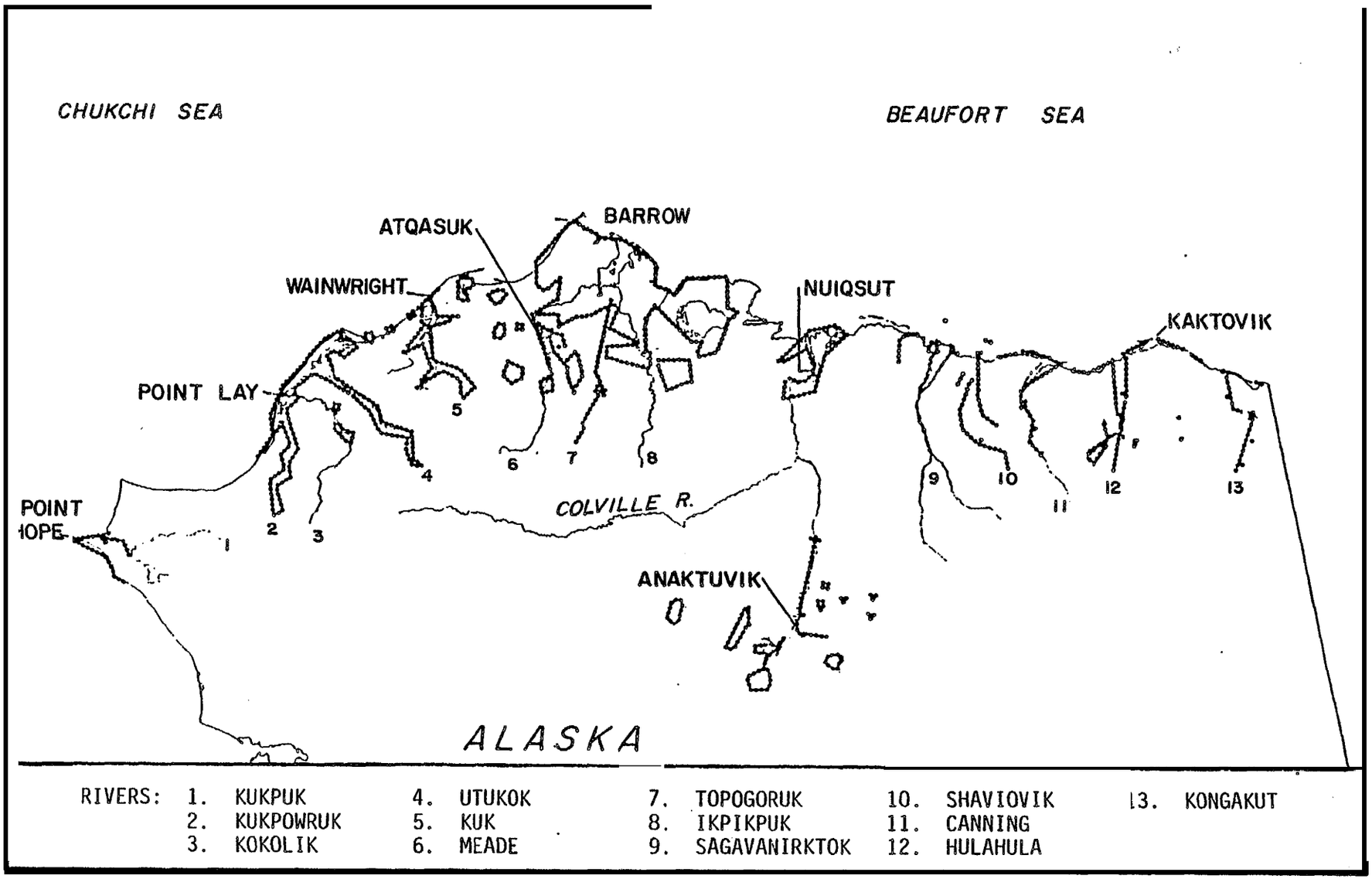


Figure 8. Areas used for subsistence fishing on the North Slope. Source: Pedersen 1979.

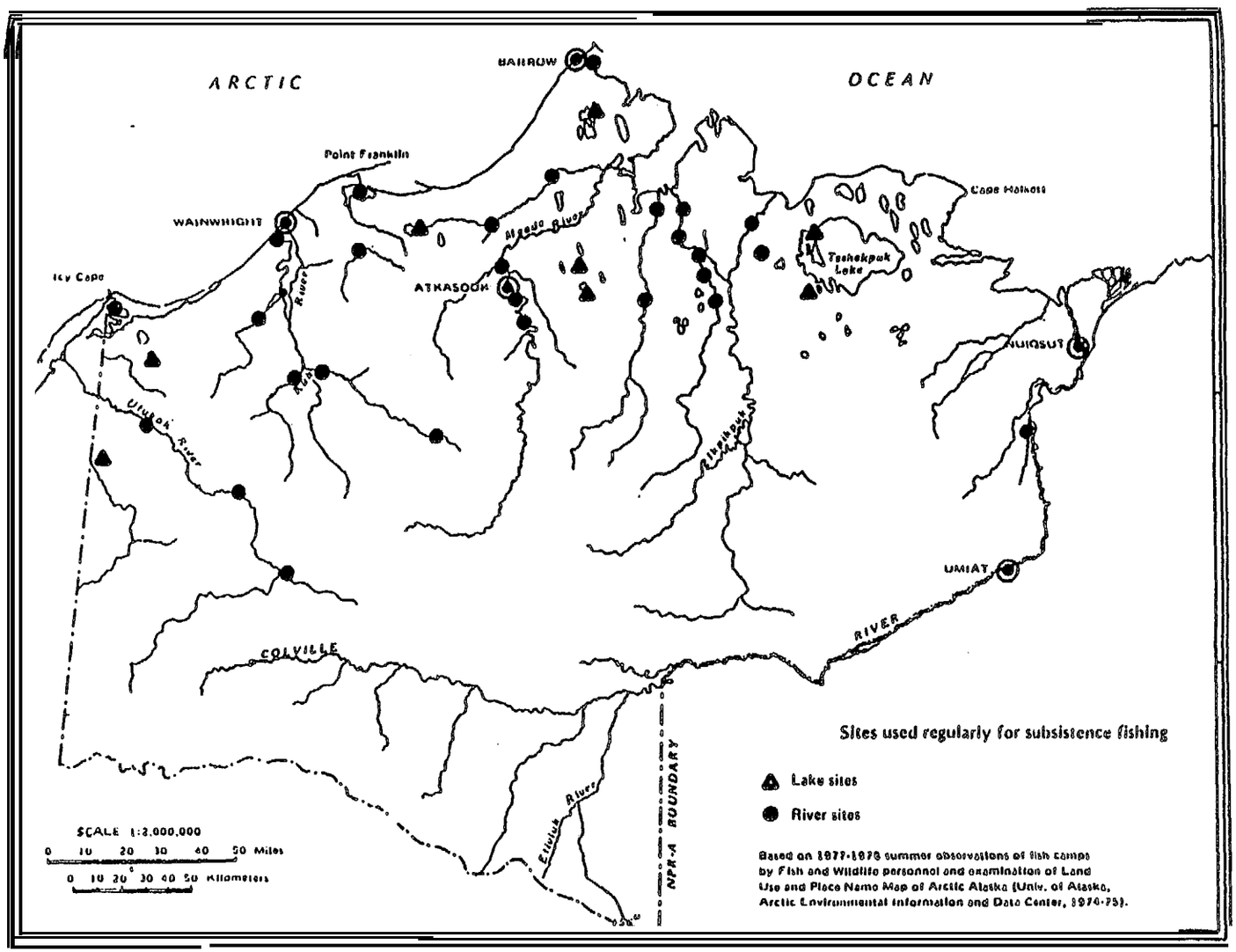


Figure 9. Sites used regularly for subsistence fishing, based on 1977-1978 summer observations by USFW personnel and examination of the Land Use and Place Name Map of arctic Alaska. Source: USDI 1978.

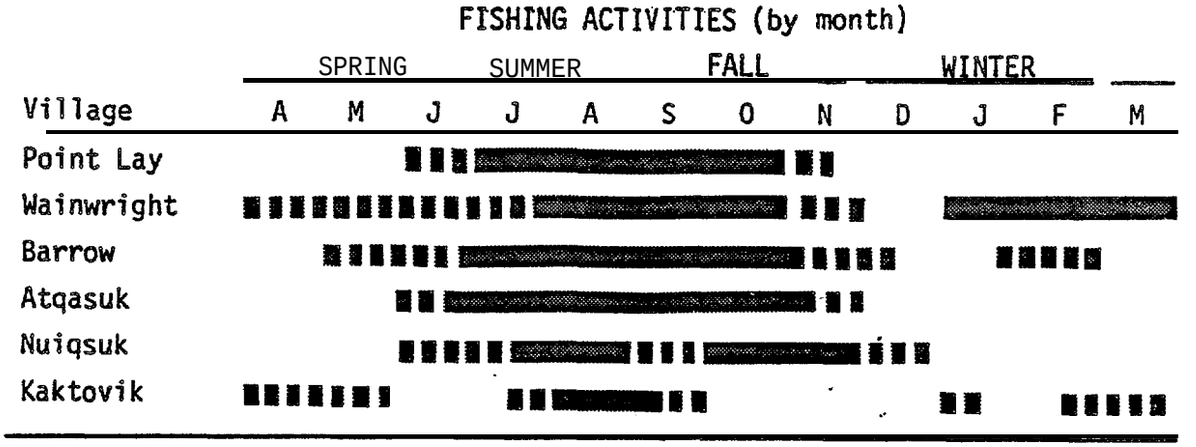


Figure 10. Seasonal patterns of fishing acclivities at North Slope villages. Solid lines indicate months when harvests usually occur; broken lines indicate occasional fishing efforts. Sources: Compiled by ADFG (1986) from Schneider (n.d.), Ivie and Schneider (1979), Hoffman et al. (1978), Schneider et al. (1980), Nelson (1981), Jacobsen and Wentworth (1982), Galginaitis et al. (1984). The Nuiqsut pattern is based on George and Nageak (1986) and Moulton et al. (1986).

## Point Lay

The small village of Point Lay is located on the Chukchi Sea coast adjacent to Kasegaluk Lagoon. The village was formed by the consolidation of numerous settlements in the region in 1930 (Schneider and Bennett 1979). In 1985 the population size was 142 people.

Fishing activities at Point Lay have been described in two reports (Schneider and Bennett 1979, Craig and Schmidt 1985) which provide the basis for this section. Supplementary information is also provided in other reports (Craig and Schmidt 1982, Braund and Burnham 1984, Alaska Consultants et al. 1984).

### *Fishery* Description

As with the other North Slope villages, the area encompassed by subsistence fishing at Point Lay is large, including coastal waters from Icy Cape to the southern end of Kasegaluk Lagoon, and inland waters including the Utukok, Kokolik and Kukpowruk rivers (Fig. 8). Summer and fall are the periods when most fishing occurs at Point Lay (Fig. 10).

Summer gillnet fishing is conducted primarily in coastal waters in July and August. Coastal areas of primary and secondary importance are shown in Figure 11, but in recent years most fishing apparently occurs within several miles of the village (Fig. 12), primarily on the lagoon side of the barrier islands. Some additional fishing occurs at Sitkok Point and at several permanent hunting camps located on both the barrier islands and the mainland south of Point Lay near Kukpowruk and Naokok passes. Summer fishing gear consists of monofilament or stranded nylon gillnets 100-150' in length and 6' deep with 3-5" stretched mesh. Species caught are pink salmon, chum salmon, and herring, with occasional char, whitefish and cisco.

During fall, a grayling fishery occurs 10-15 mi upstream on the Kukpowruk River. This occurs around October, depending on freeze-up conditions, and may extend over several days or weeks and involve a relatively large number of villagers. Most grayling are caught by jigging a lure through holes drilled in the ice.

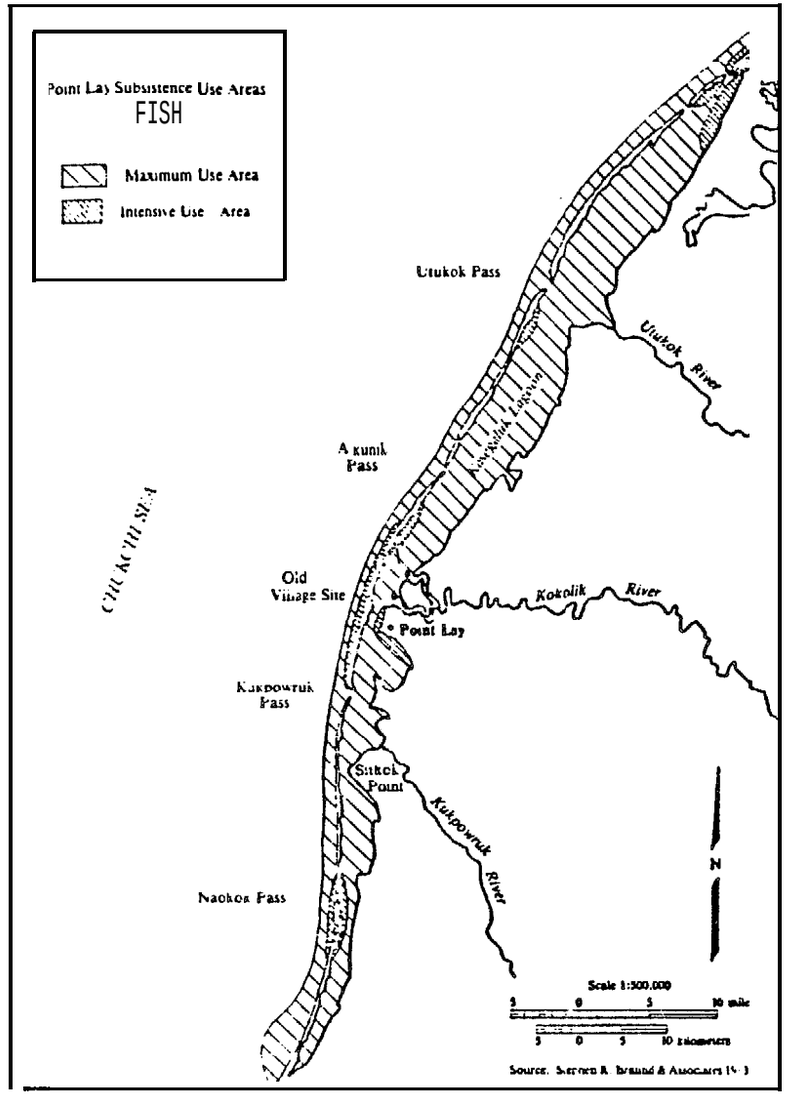


Figure 11 Point Lay subsistence use areas for fish. Source : Braund and Burnham 1984.

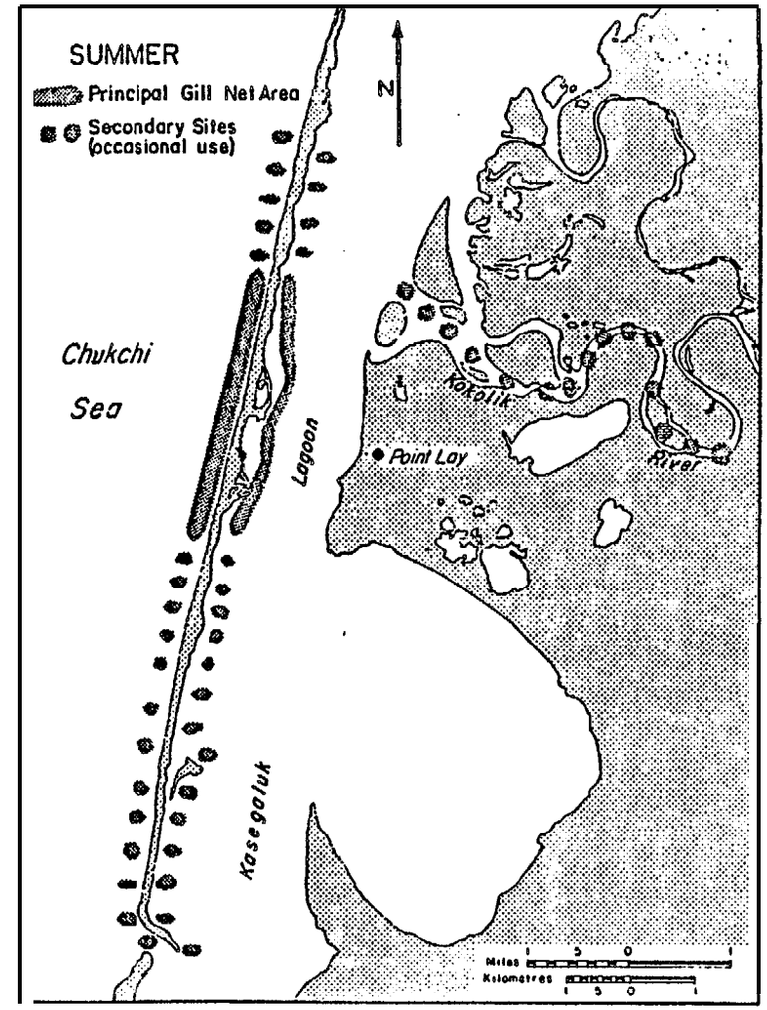


Figure 12 Point Lay subsistence fishing sites, 1983. Source: Craig and Schmidt 1985.

Harvest Quantity

Although fish have been described as a primary resource for the village and an integral part of their summer and fall subsistence activities (Schneider and Bennett 1979, Braund and Burnham 1984), the harvest was sparse during the only year (1983) when catches were monitored (Craig and Schmidt 1985).

In 1983 the summer fishery was brief (4-11 August) and was directed toward the capture of salmon migrating past the village (Table 3). only four fishermen participated, for a combined effort of approximately 16 man-days. Craig and Schmidt (1985) assessed the harvest at the village by inspection of daily catches or interviews with the fishermen after each catch, and this quantity was doubled to account for possible catches away from the village that were not observed. An estimate of the fall fishery was obtained by interviews with local residents.

The summer fishery (143 lb, mostly pink salmon) and fall fishery (250-300 lb, mostly grayling) yielded a total catch of about 400-450 lb, for an annual per capita catch of 3-4 lb in 1983. Residents suggested that the 1983 harvest was smaller than occurs in most years. The previously-mentioned cycles in the abundance of pink salmon in arctic waters (i.e., pinks are less abundant in odd-numbered years) probably contributed to the low summer harvest in 1983.

## Wainwright

Wainwright is a small community on the Chukchi Sea coastline adjacent to Wainwright Inlet (also called Kuk Lagoon or lower Kuk River). In 1985 the population size was 507.

The annual cycle of fishing activities at Wainwright has been described in detail by Nelson (1981) and JMI (1983). Nelson based his description on research he carried out between 1964 and 1981. JMI conducted *their* household surveys. in 1982. Supplementary information is also provided in several other reports (Bane 1966, Nelson 1966 and 1969, Ivie and Schneider 1979, Craig and Schmidt 1982, Braund and Burnham 1984, Alaska Consultants et al. 1984).

**Table 3.** Estimated total subsistence harvest of fishes in the Point Lay area, 1983. Source: Craig and Schmidt 1985.

| | Estimated Number of Fish Caught | | | Estimated Total Weight[2] (lb) |
|---|---|---|---|---|
| | Point Lay | Other[1] Sites | Total | |
| SUMMER FISHERY | | | | |
| Pink salmon | 18 | N | 36 | 86 |
| Herring | 30 | N | 60 | 21 |
| King salmon | 1 | N | 2 | 12 |
| Arctic char | 3 | N | 6 | 12 |
| Bering cisco | 5 | N | 10 | 11 |
| Rainbow smelt | 3 | N | 6 | 1 |
| TOTALS | 60 | | 120 | 143 |
| FALL FISHERY | | | | |
| Grayling | N | N | N | 250-300[3] |

[1] N (not monitored). Sites away from Point Lay such as hunting camps were not monitored. Observations suggest that the harvest of fish on such occasions was very low, if any, during the 1983 summer. Therefore, it was conservatively assumed that the harvest away from the village was similar to that at the village.

[2] Original data of Craig and Schmidt (1985) have been corrected here. Total weight = no. fish x average weight of each species. Average weights were estimated from specimens caught during the study.

[3] Total weight was estimated by local fishermen.

## Fishery Description

Fishing at Wainwright may occur year-round, but efforts are greatest in late summer and mid winter (Fig. 10). The areas fished include nearshore coastal waters between Point Franklin and Icy Cape, and inland waters primarily along the Kuk River but also on the Kugrua, Utukok and other nearby rivers (Figs. 8 and 13).

In summer (July, August), people fish with gillnets along the beach in front of the village or in Wainwright Inlet (Fig. 14). Ocean gillnets, set about 50 m from shore, have 3-6" stretched mesh; river gillnets have slightly smaller meshes (3-5"). JMI (1983) noted that a typical ocean catch in late June was 10-18 fish/day, mostly pink and chum salmon with a few char and other species. Nets set in late July also caught mostly pink and chum salmon (Craig and Schmidt 1982). Fishing in the inlet yields rainbow smelt, whitefish, cisco and cod.

In late summer and fall (August-October), fishing in the Kuk River intensifies. Nelson (1981) observed fish camps at several upstream locations in the Kuk drainage (see also Fig. 9) where grayling, cisco, burbot and smelt were taken.

In winter (January-March), rainbow smelt are caught in Wainwright Inlet by jigging with a slender pole about 2.5' long with 4-6' of monofilament line and a small bright 'nook attached (Nelson 1981). The smelt from the inlet are highly regarded and may be exchanged between villages. JMI (1983) notes that these smelt have the distinction of being the only species of animal or plant that is regularly bought and sold in Wainwright.

Smelt are the only important fish regularly harvested in winter. Tom-cod (saffron cod) in the ocean were formerly caught in winter but they are not fished at present.

## Harvest Quantity

The only quantitative estimate of fish harvests at Wainwright is provided by Patterson *(1974)* who based his estimate on information supplied by village representatives from 1969 to 1973. Harvest estimates

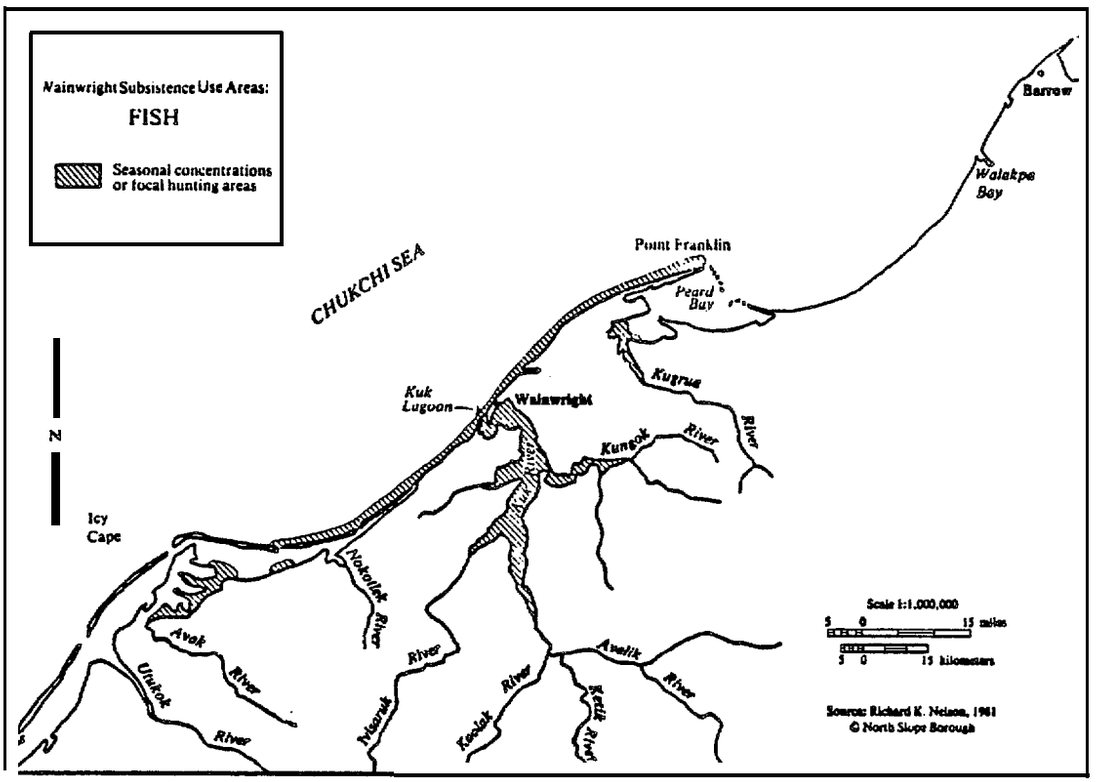


Figure 13. Wainwright subsistence fishing areas. Source: R. Nelson. North Slope Borough (1981) as presented in Braund and Burnham (1984).

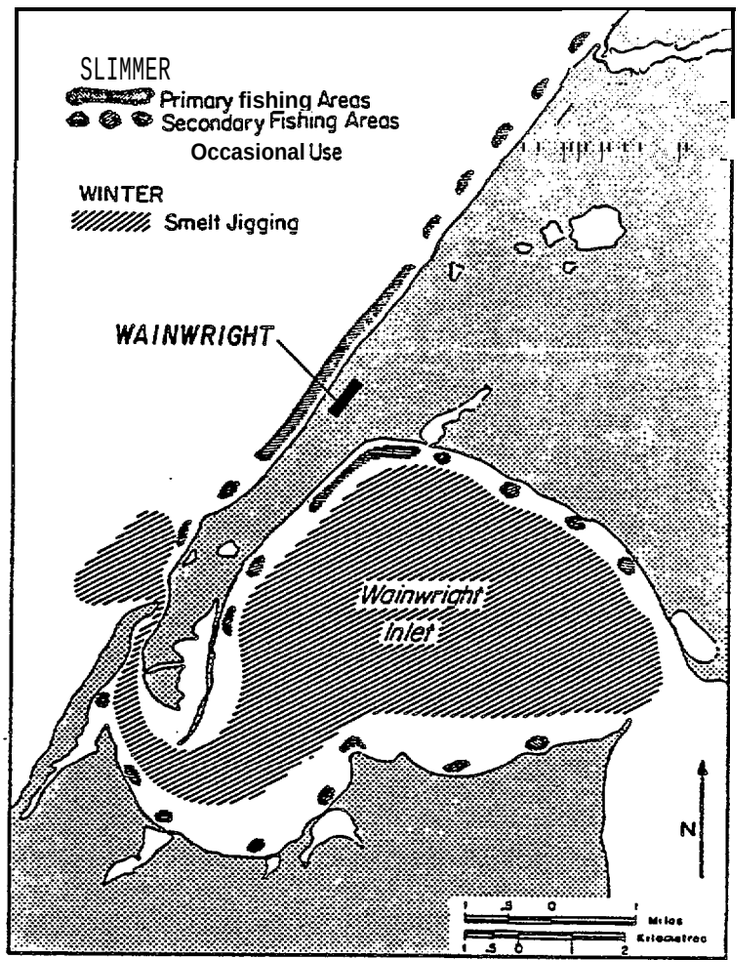


Figure 14. Wainwright subsistence fishing areas. Source : Craig and Schmidt 1982.

found in several later reports all stem from Patterson's data (Patterson and Wentworth 1977, AEIDC 1978, Stoker 1983, ADFG 1986).

During 3969-1973, the average annual fish harvest was low (about 3800 lbs), amounting to less than 1% by weight of the total harvest of all resources (mammals, birds, fish, plants) during the same period (Table 4). The annual per capita catch of fish was 9 lbs. Stoker (1983) used Patterson's figures as the estimated average fish catch over the 20-year period 1962-1982. ADFG (1986) cautions that these quantities are rough approximations because data were not systematically collected or verified.

Nelson (1981) observed that there has been a resurgence of interest in fishing at Wainwright in recent years. In 1976, for example, the North Slope Borough (cited in AEIDC 1978) estimated that a typical subsistence harvest of fish was 500 lb for a 6-member family, which equals an annual per capita consumption of 83 lb. Supportive documentation for the derivation of this estimate was not provided in the AEIDC report.

## Barrow

Barrow is the largest community on the North Slope (excluding the industrial center in the Prudhoe Bay area). The present-day site of Barrow has probably been occupied continuously for about 1300 years. The population has grown steadily in recent years to 3075 people in 1985, which includes a large proportion of non-Natives (40%).

Descriptions of contemporary fishing activities at Barrow have been made by several authors (Pedersen et al. 1979, Schneider et al. 1980, Braund and Burnham 1984). Supplementary information, particularly of earlier fishing practices, is also available (e.g., Murdoch 1884, Wilimovsky 1956, Sonnefeld 1956, Hall 1983, Stern 1985). It should also be noted that subsistence fishing activities by Barrow residents overlap spatially with those of Atqasuk residents (Fig. 3), but the degree to which this currently occurs is not known.

### Fishery Description

Fishing by Barrow residents occurs primarily in summer and fall (Fig. 10). The area fished is extensive (Figs. 15 and 16) because hunters

Table 4. Estimated harvest of fish at Barrow, Wainwright and Kaktovik based on interviews with village representatives, 1969-1973. Source: Patterson 1974.

| Fish | Fish Harvests | | | | | |
|---|---|---|---|---|---|---|
| | Barrow | | Wainwright | | Kaktovik | |
| | No. | Pounds | No. | Pounds | No. | Pounds |
| Herring | 10,000 | - | - | - | | |
| Whitefish (large) | 8,000 | - | - | - | | |
| Whitefish (small) | 8,000 | - | 600 | - | 2500 | |
| Grayling | 2,500 | - | 150 | - | | |
| Coho/Silver salmon* | 200 | - | - | - | | |
| Pink salmon | 200 | - | 50 | - | | |
| King salmon* | 200 | - | 30 | - | | - |
| Smelt | - | - | - | 1000 | | 1000 |
| Trout | 50 | - | 200 | - | 1000 | |
| Arctic char | 100 | - | - | - | 2500 | |
| Burbot | 100 | - | - | - | | |
| Tom cod | 500 | - | - | - | | |
| TOTALS | | | | | | |
| number | 29,850 | | 1 030+ | | 6000+ | |
| weight (dressed lb) | | 61,550 | | 2840 | | ***15,500*** |
| weight (total lb)** | | 83,000 | | 3800 | | 27,000 |
| % Fish in Total Harvest*** | | 5 | | 0.6 | | 14 |
| Per Capita Consumption (lb) | | 32 | | 9 | | 131 |

● Coho and king salmon are *rare* in these waters (see Craig and Haldorson 1985). These fish could have been sea-run chum salmon.

**Calculated as dressed weight = 75% total weight.

***Includes mammals, birds, fish and other wildlife.

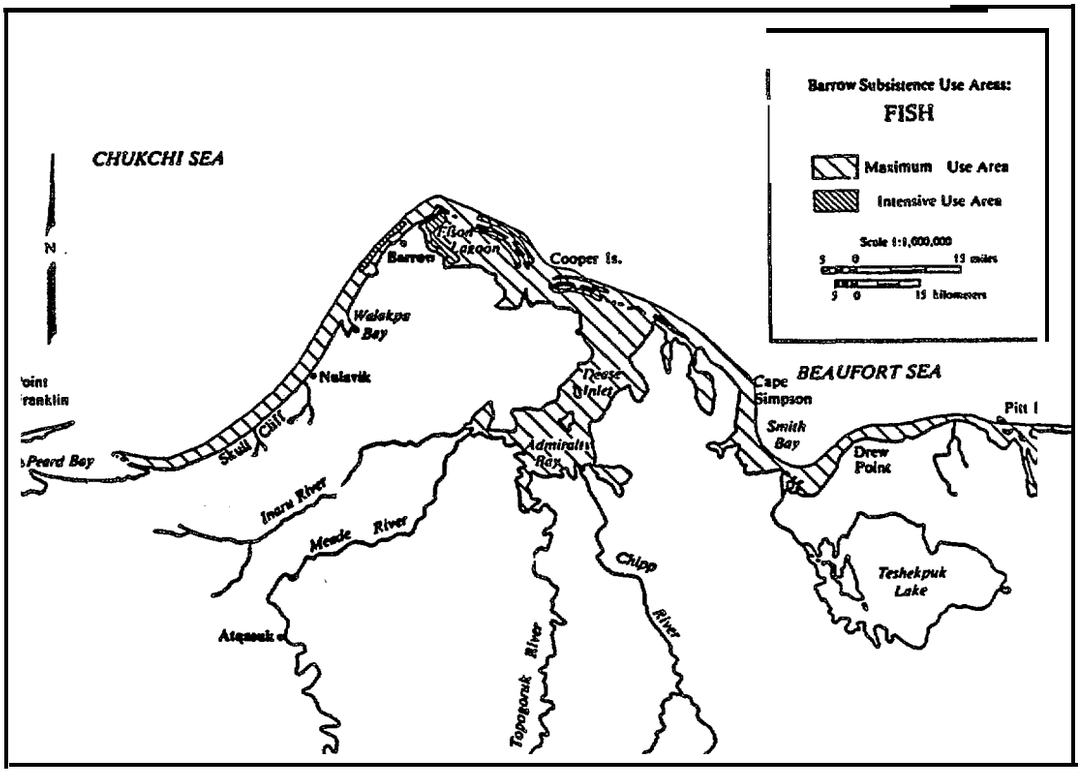


Figure 15. Barrow subsistence fishing areas. Source: Braund and Burnham 1984.

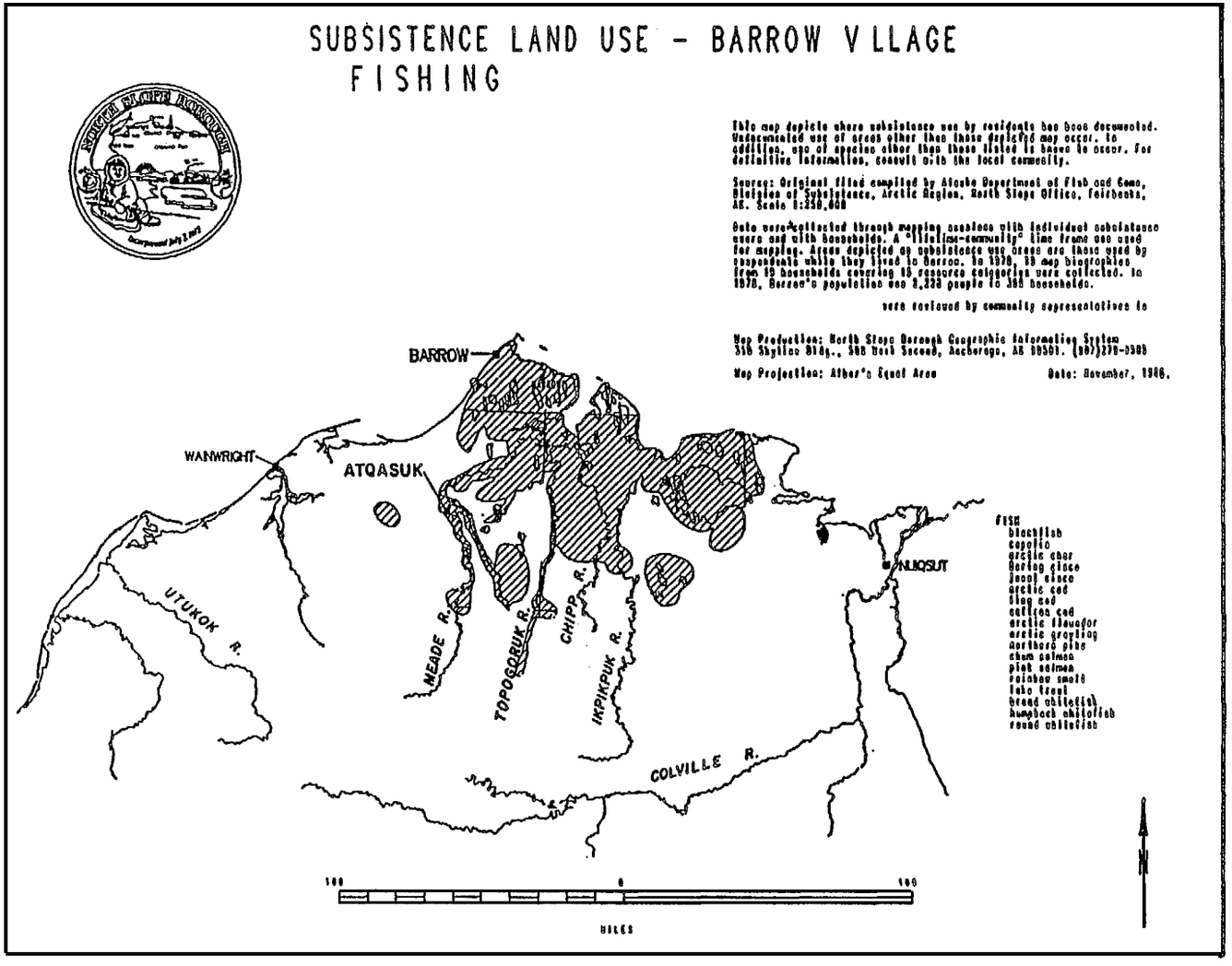


Figure 16. Barrow subsistence fishing areas. Source: North Slope Borough, Geographic Information System, Anchorage, AK.

traveling from Barrow often supplement their food supply with fish. In addition, numerous fish camps are situated on lakes and rivers in the region.

Coastal fishing areas extend from Peard Bay to Pitt Point (Fig. 15), but most fishing occurs closer to Barrow in three areas: (1) along the Chukchi Sea coastline from Point Barrow to Walikpa ("Ualiqpaat") Bay located 14 mi SW of Barrow, (2) inside Elson Lagoon near Barrow, and (3) along the barrier islands of Elson Lagoon. Fish are usually caught along shorelines by monofilament gillnets up to 50' long with 3.5" mesh. Species taken are salmon, whitefish, cisco, and char. Summer collections of shore-spawning capelin and winter jigging for arctic cod are activities which have diminished in recent years.

While coastal, fishing can be an important source of fish, most of the harvest occurs at inland fish camps, particularly in lakes and rivers which flow into the southern end of Dease Inlet. As summer progresses, inland fishing activities increase and continue into November. Some families spend the summer and fall at fish camps in the Inaru, Meade, Topogoruk, and Chipp drainages. Fish are caught mostly by gillnet, with some angling. Species harvested include whitefishes, least cisco, grayling, and a few burbot and salmon.

Harvest Quantity

Harvest data for Barrow include an annual catch estimate for the period 1969-1973 (Patterson 1974), and partial catches for 1962 (Hanson et al. 1966) and 1986 (George 1986). Estimates found in several other reports all use Pattersonts data (Nielson 1977, Patterson and Wentworth 1977, AEIDC 1978, Hall 1983, Stoker 1983, ADFG 1986).

During 1969-1973, the average annual harvest of fish was about 83,000 lb (Table 4). This amounted to 5% by weight of the total harvest of subsistence resources and an annual, per capita catch of 32 lb of fish. Stoker (1983) used Pattersonts figures as the estimated annual harvest over the 20-year period 1962-1982. Limitations concerning this quantification of the fish harvest were mentioned earlier (see 'Wainwright'). Also, the smelt listed in the "Barrow harvest" (Table 4)

are actually fish that were caught in Wainwright Inlet and purchased by Barrow residents (Charlie Brower, pers. comm.).

The 1962 partial estimate of fish harvests was derived from interviews with 248 adults at Barrow (Hanson et al. 1966). Fish (mostly whitefish) accounted for 23% by weight of the total subsistence resources consumed by adults and 7% of an adult's total diet of both subsistence and store foods. Fish consumption was estimated to be 2.0-2.2 lb/week, for a yearly per capita consumption of 104 lb per adult. (An extrapolation of this information to calculate the total annual harvest would require more information than is available, i.e., the number of both adults and non-adults present in 1966, the amount of fish consumed by non-adults, and the amount of fish used for other purposes such as dog food.)

The 1986 partial estimate of fish harvests was for the fall fishery in the lower Inaru River. During 17-19 October 1986, George (1986) monitored the. catch at "Puulayaq" located 2 mi west of Sisgravik Lake. Fishermen used gillnets 50-60' long with 2.5-3.0" mesh. The observed catch per unit effort was 93 fish/24 hr set and consisted of 424 fish equalling about 675 lb (using the average weights listed in Table 1). The catch composition was least cisco (45%), broad whitefish (36%), humpback whitefish (16%), arctic cisco (1%), fourhorn sculpin (1%), and burbot *(0.5%).*

## Atqasuk

In the mid 1970's, the village of Atqasuk was re-established on the Meade River 60 mi south of Barrow. The population had grown to 248 people in 1985. As previously noted, the subsistence activities of Atgasuk residents overlap spatially with those of Barrow residents (Fig. 3), but the degree to which this currently occurs is not known.

The most detailed description of the Atgasuk fishery is provided by Sekerak et al. (1985). Additional information (Pedersen et al. 1979, Schneider et al. 1980) and supplementary notes (Craig and Schmidt 1982, Hall 1983, Braund and Burnham 1984, ADFG 1986) are also available.

## Fishery Description

Most subsistence fishing by Atqasuk residents occurs in summer and fall (Fig. 10) in the Meade River within a few miles of the village (Fig. 17). Fish camps are also located on two nearby streams (Usuktuk and Nigisakituvik rivers) and farther downstream on the Meade River near the Okpiksak River.

Gillnets (usually 50' long with 2.5-5.5" stretched mesh) are the main gear used, although angling and some use of set lines (for burbot) also occurs. Fishing in the Meade River begins after the spring freshet in mid to late June when debris in the water has decreased. Fishing declines in September when drifting ice prohibits use of gillnets. Fall and early winter fishing (gillnets and jigging) begin after freeze-up and extend through late November or early December.

Humpback whitefish and least cisco accounted for 96% of the summer catch in 1983. Other species caught were grayling, broad whitefish, burbot, and in some years chum salmon. Winter catches in the Meade River near the village consisted mostly of humpback whitefish, grayling, and some broad whitefish.

## Harvest Quantity

Quantitative data are available only for1983 when Sekerak et al. (1985) documented the fish harvest by means of direct observation, interviews, and questionnaires given to the fishermen.

In 1983, fishing effort was fairly constant from mid July to early September when up to 12-16 gillnets were often in daily use, with an average effort of about 75 net-days per week (Fig. 18). The summer gillnet fishery in the Meade and Usuktuk rivers caught approximately 8450 lb of fish (Table 5). With the addition of summer catches by other gear (1100 lb primarily by angling) and winter catches (2700 lb), the total harvest was approximately 12,250 lb. The annual per capita catch of fish was thus about 43 lb in 1983 (when the population size was 231).

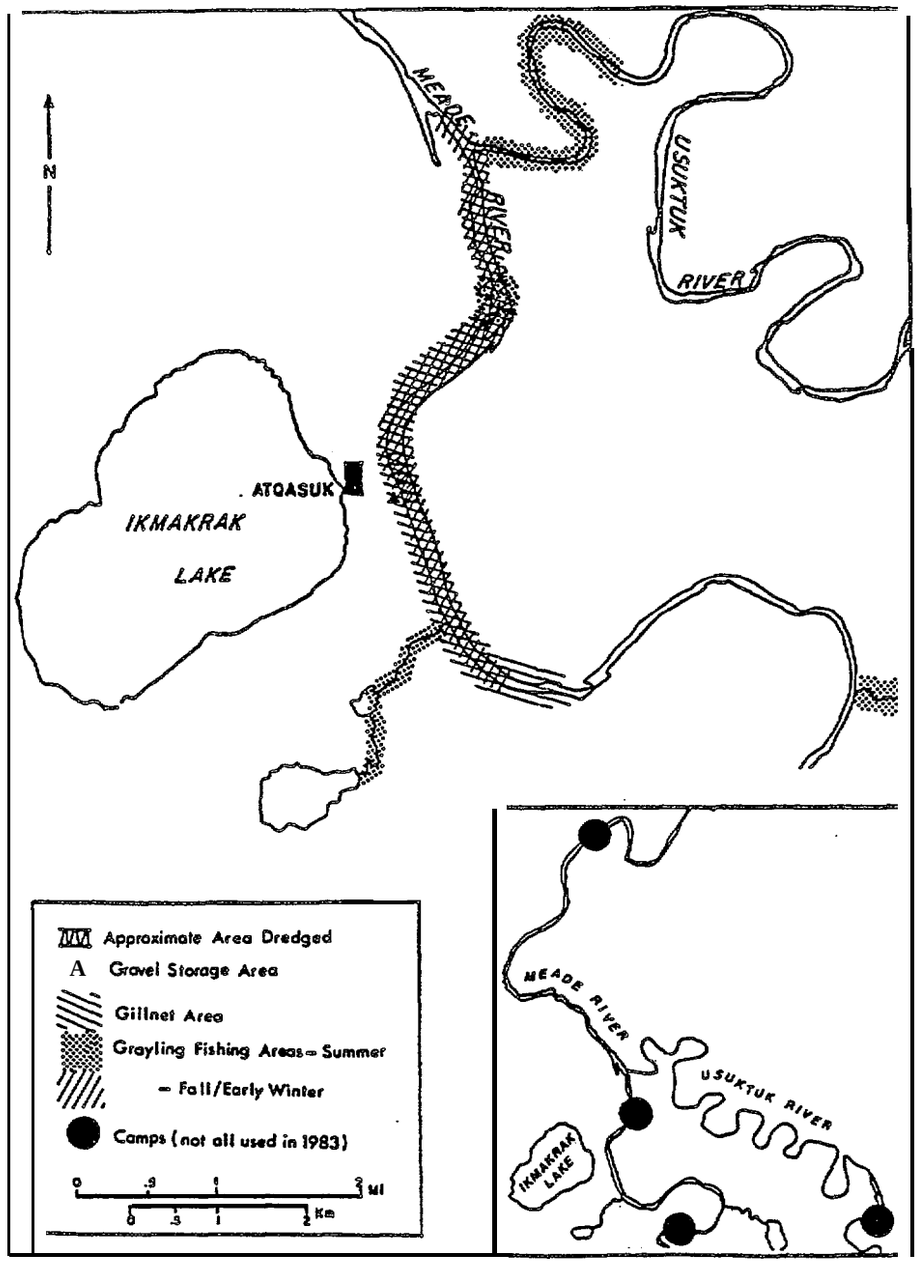


Figure 17. Important fishing areas adjacent to Atqasuk, 1983. Source: Sekerak et al. 1985.

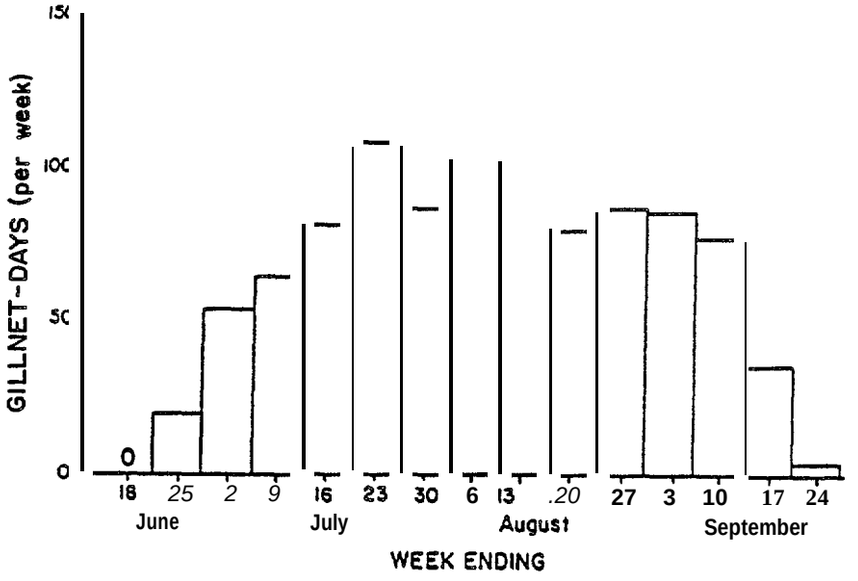


Figure 18. Atqasuk fishing effort during the summer gillnet fishery in the Meade and Usuktuk rivers, 1983. Source: Sekerak et al. 1985.

*Table 5.* Estimated fish harvest at Atqasuk in 1983. Source: Sekerak et al. 1985.

| Fishery Component | Estimated Fish Harvest Number | Weight (lb) |
|---|---|---|
| A. Summer Fishery (Gillnet) | | |
| Humpback *whitefish* | 3285 | 4380 |
| Least cisco | 4283 | 3730 |
| Broad *whitefish* | 114 | 174 |
| Burbot | 157 | 135 |
| Grayling | 43 | 31 |
| Salmon* | | |
| | 7882 | 8450 |
| B. Summer Fishery (Angling, Set Line) | | |
| All species | | 1100 |
| Winter Fishery (Gillnet) | | |
| All species | 2700 | 2700** |
| TOTAL | | 12,250 |

*Salmon are caught in some years (Craig and Schmidt 1982).

**Author's original estimate of 500 lb was derived from gillnets with smaller mesh size than is used in the fishery (A. Sekerak, pers. comm.), therefore average weights of whitefish and cisco from the summer fishery were substituted here.

## Nuiqsut

In 1973 the village of Nuiqsut was re-established in the delta of the Colville River, and by 1985 the population size was 332 people.

The Colville River is well-known for its abundance of fish (see also Fig. 4). The Colville delta supports both a sizable subsistence fishery for Nuiqsut residents as well as the only commercial fishery (Helmericks) in the study area. The Nuiqsut fishery has received considerable attention in recent years, and several reports provide detailed information (Hoffman et al. 1978, Libbey et al. 1979, George and Nageak 1986, George and Kovalsky 1986, Moulton et al. 1986, Entrix 1987). An additional report by Pedersen (1987) was not available in time for this review. Supplementary information is available in several other reports (NSB 1979b, Craig and Schmidt 1982, Galginaitis et al. 1984? ADFG 1986).

### Fishery Description

The fishery at Nuiqsut consists primarily of gillnetting for anadromous fishes in the main channels of the lower Colville River and in nearby Fish Creek (Figs. 8, 19 and 20). Recent studies indicate that the main fishing periods occur in summer and fall/winter (Fig. 10) rather than spring and fall as indicated in earlier reports (e.g., Libbey et al. 1979).

Broad whitefish are the primary target of a gillnet fishery in summer (June-September). Fishing efforts are concentrated in three areas: the Nigliq (Nechelik) Channel, Fish Creek, and the Colville River upstream of Nuiqsut in the Tiragruaq area (Fig. 19). Large-mesh gillnets (50-100' long, 4-5.5" stretched mesh) catch large specimens of broad whitefish and other species (Table 6). Daily catch rates are generally low at this time of year--2-5 fish/net-day in July 1984 (George and Nageak 1986), and similar rates in 1985 (Table 6).

The fall/winter fishery is an under-ice effort primarily for arctic cisco. Fishing efforts are concentrated in three areas: the upper Nigliq Channel near Nuiqsut, the lower Nigliq Channel near Woods Camp, and the outer Colville delta on the main (Kupigruak) channel (Fig. 20).

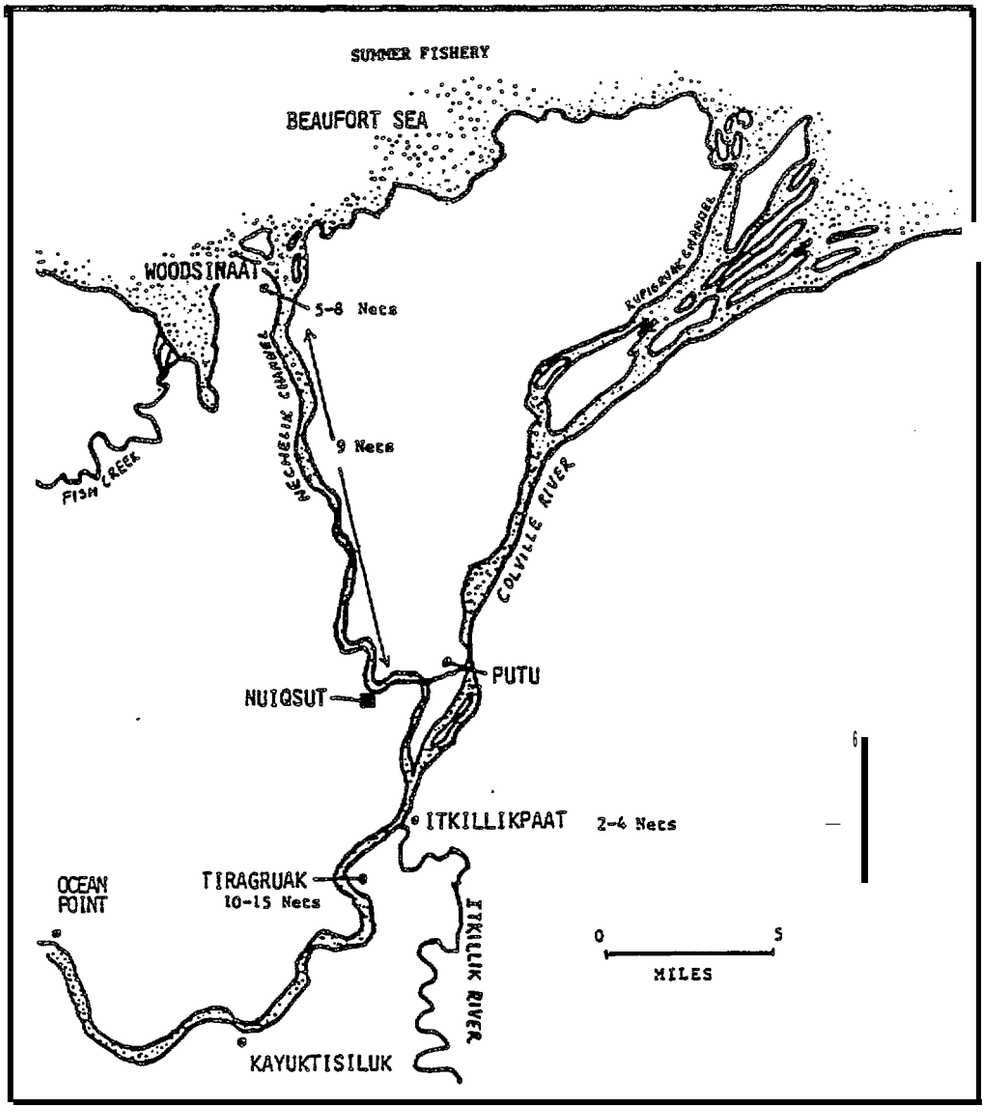


Figure 19. Nuiqsut summer fishery showing locations of gillnets in the Colville delta, July 1984. Source: George and Nageak 1986.

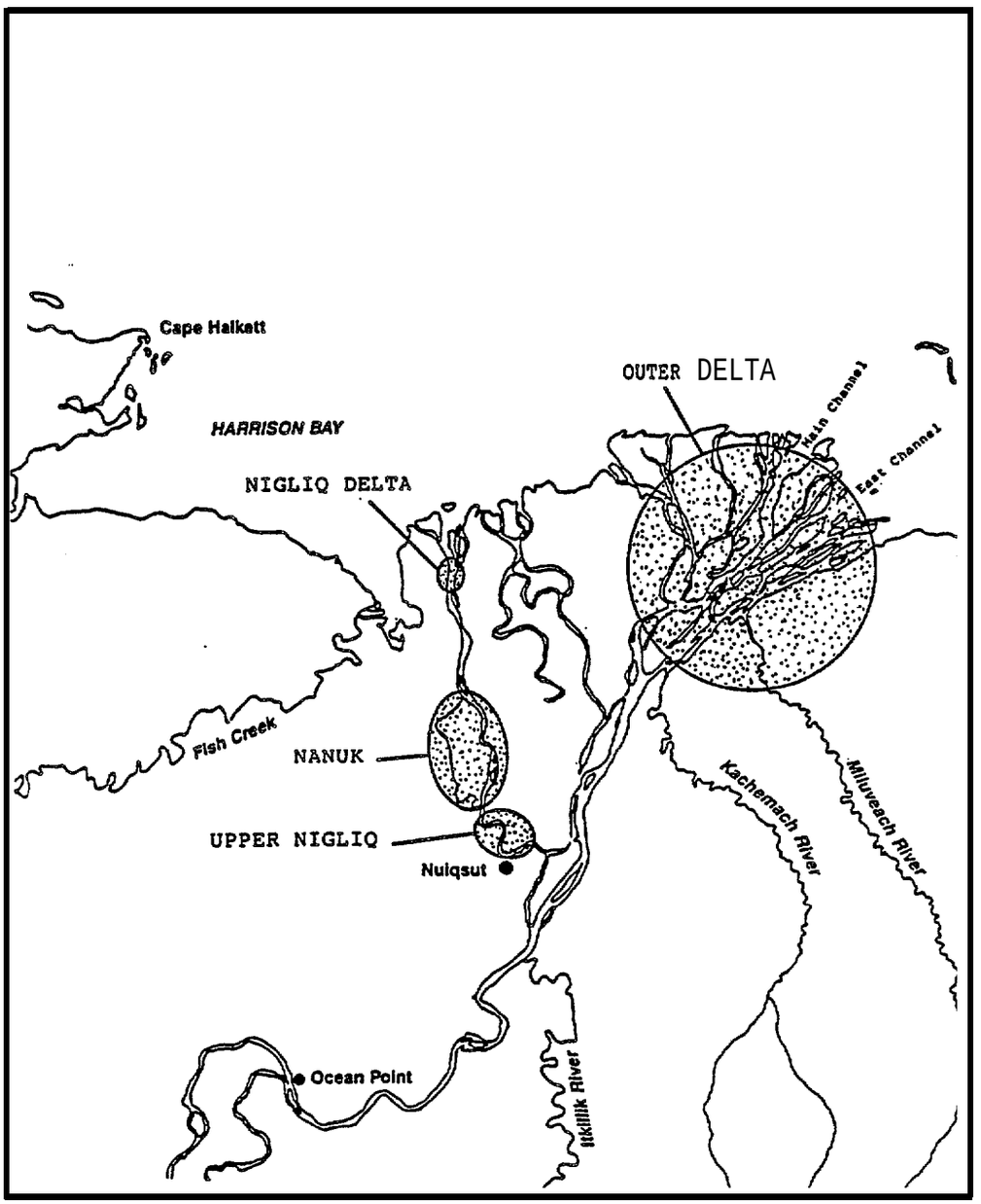


Figure 20. Nuiqsut under-ice fishing areas in fall and early winter. Source: Entrix 1987.

Table 6. Nuiqsut summer fishery: fish sizes and catch per unit effort (CPUE) in large-mesh gill nets. Source: Moulton et al. 1986.

| Species | Fork Length (mm) Mean | Fork Length (mm) (Range) | CPUE (Fish/Net-day) |
|---|---|---|---|
| Broad whitefish | 529 | (365-650) | 1-8 |
| Humpback whitefish | 439 | (405-525) | 0-1 |
| Arctic char | 600 | (520-765) | 0-4 |
| Pink salmon | 524 | (475-595) | |

Additional fishing sites include the Fish Creek area and the Colville River upstream of the village near Kayuktisiluk (see Fig. 19).

Fall fishing begins in early October when the ice is safe to travel on, and extends into November. Peak fishing effort occurs during the last half of October. Sinking gillnets of 2.5-3.5" stretched mesh are the standard gear, with 3" mesh the most common. The catch rate is often about 15-32 fish/net-day and up to about 100 fish/net-day, which is considerably higher than the catch rate during the summer fishery. While arctic cisco are the target of this fishery, large numbers of least cisco are caught as well as some humpback whitefish, broad whitefish, rainbow smelt, and fourhorn sculpin. The abundance of arctic cisco in the Colville delta is highly variable, as previously described (Fig. 7).

Harvest Quantity

Harvest data for Nuiqsut include annual catch estimates for 1985 (Moulton et al. 1986) and 1985-86 (Pedersen 1987), and partial catch estimates for 1984 (George and Nageak 1986), 1985 (George and Kovalsky 1986), and 1986 (Entrix 1987).

Moulton et al. (1986) and Pedersen (1987) used different methods but arrived at similar estimates for the 1985 fish. harvest at Nuiqsut. Moulton et al. (1986) estimated the harvest by interviews with local fishermen, periodic counts of nets in the water, and occasional trips with the fishermen as they tended their nets. About 20 groups of fishermen participated in the summer fishery. Fishing effort was greatest in late July and early August, (Fig. 21), with a total effort of about 1000 net-days. The summer catch totaled about 19,260 lb, mostly broad whitefish (Table 7). In fall, approximately 30 fishing groups had a combined effort of about 1800 net-days (not including 910 net-days by the commercial fishery) and caught about 60,900 lb. Some grayling and other freshwater fishes were also caught, but the quantity is thought to be small compared to the documented portion of the harvest. The annual catch was thus about 80,160 lb, for an annual per capita catch of 241 lb. It should be noted, however, that some of this catch is not consumed locally but is shipped to Barrow.

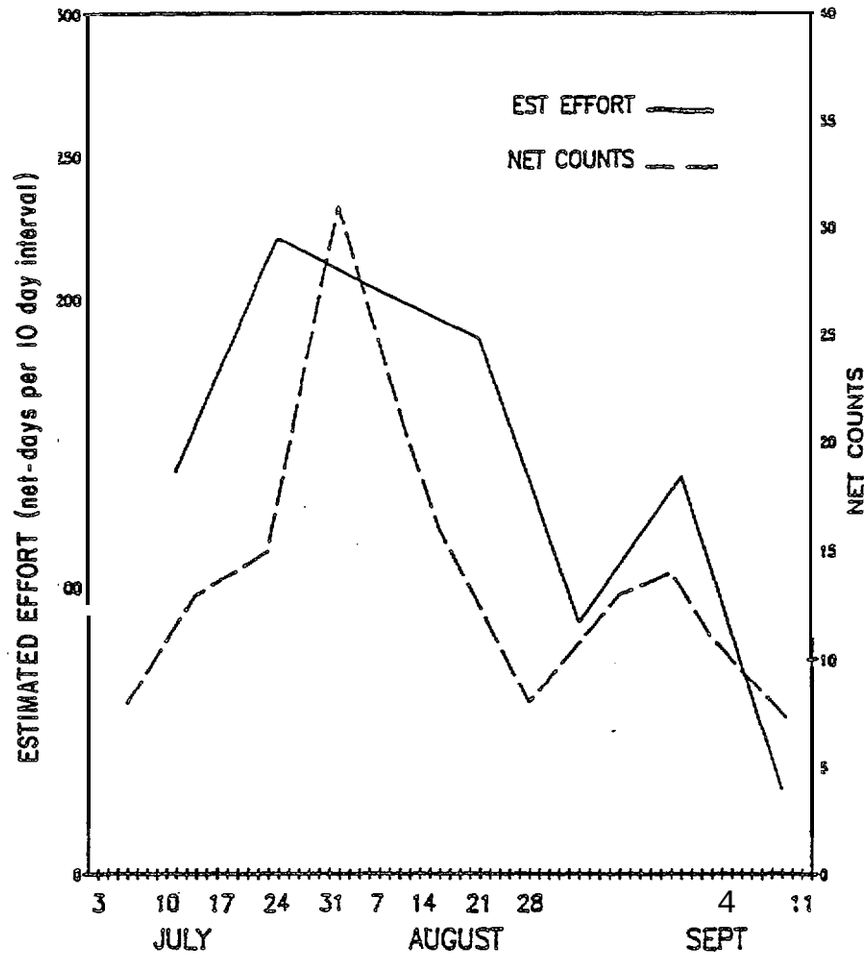


Figure 21. Nuiqsut summer fishery: seasonal gillnet effort, 1985. Source: Moulton et al. 1986.

Table 7, Nuiqsut fish harvest in 1985. Source: Moulton et al. 1986.

| Season and Location | Number Harvested* | | | | | | Total (lb) |
|---|---|---|---|---|---|---|---|
| | Broad whitefish | Humpback whitefish | Arctic char | Arctic cisco | Least cisco | Other | |
| A. SUMMER FISHERY | | | | | | | |
| Nigliq Channel | 3,053 | 293 | 126 | | | | |
| Colville River | 596 | 9 | 189 | | | | |
| Fish Creek | 180 | | | | | | |
| Total number | 3,829 | 302 | 315 | | | | |
| Total weight (lb)* | 17,230 | 580 | 950 | | | 500** | 19,260 |
| B. FALL FISHERY | | | | | | | |
| Nigliq Channel (upper) | 1,468 | | | 17,878 | 1,871 | | |
| Nigliq Channel (lower) | | | | 8,500 | | | |
| Colville Delta (outer) | | | | 20,303 | 13,943 | | |
| Total number | 1,468 | | | 46,681 | 15,814 | | |
| Total weight (lb)* | 6,610 | | | 43,120 | 11,170 | | 60,900 / 80,160 |

*Does not include Helmericks' commercial catch.

**Estimated based on catch proportion (other species = 4% of catch),

Pedersen's (198'7) report is in preparation butheprovideda preliminary estimate of the fish harvest at Nuiqsut for the period July 1985 to June 1986. Because relatively little fishing occurs from January to June at the village (Fig. 10), Pedersen's data pertain mostly to 1985. Based on interviews with 40 of the 75 households in the village, Pedersen estimated the fish harvest of this subsample to be about 37,000 lb of usable or dressed weight (Table 8). An expansion of these data to all 75 households in the village yields 70,000 lb dressed weight or 94,000 lb total weight. The annual per capita catch was thus about 282 lb of fish, although as mentioned above, some of this catch was shipped outside the village. (For comparative purposes, the 1985 commercial fishery in the Colville delta harvested approximately 20,600 lb of arctic cisco and 12,300 lb of least cisco.)

Three partial estimates of fish harvests at Nuiqsut are as follows:

(a) 1984. Based on limited data, George and Nageak (1986) estimated that the summer fishery caught more than 1000 broad whitefish, and the fall fishery caught about 12,000 arctic cisco and probably the same number of least cisco.

(b) 1985. Data collected by George and Kovalsky (1986) were used by Moulton et al. (1986) to arrive at the total 1985 estimate described above.

(c) 1986. In a detailed study of the fall fishery, Entrix (1987) documented that 33,522 arctic cisco and 6805 least cisco were taken in the subsistence fishery. This amounts to about 35,700 lb of fish (calculated using the conversion factors of Moulton et al. 1986). Due to a reduced fishing effort in 1986 at Nuiqsut, the fall harvest was only 59% of that taken the previous year (60 ,900 lb).

Table 8. Nuiqsut fish catch based on preliminary data from household surveys, 1985-86. Source: Pedersen 1987.

| Fish | Estimated Usable Weight (lb) | | Estimated Total Harvest[2] | | |
|---|---|---|---|---|---|
| | Subsample[1] | Total | No. Fish[3] Caught | Weight/Fish[4] (lb) | Total Weight (lb) |
| Broad whitefish | 14,137 | 26,674 | 7,845 | 4.5 | 35,300 |
| Arctic cisco | 11,509 | 21,715 | 31,021 | 0.9 | 27,920 |
| Least cisco | 39904 | 7,366 | 14,732 | 0.7 | 10,310 |
| Grayling | 1,901 | 3,587 | 3,986 | 1.0 | 3,990 |
| Humpback whitefish | 1,830 | 3,453 | 4,316 | 1.9 | 8,200 |
| Arctic char | 1,562 | 2,947 | 1,053 | 3.0 | 3,160 |
| Burbot | 1,208 | 2,279 | 570 | 4.0 | 2,280 |
| Salmon | 719 | 1,357 | 438 | 5.0 | 1,750 |
| Smelt | 84 | 158 | 3,160 | 0.2 | 630 |
| Lake trout | 48 | 91 | 23 | 8.5 | 200 |
| Round whitefish | 5 | 9 | 9 | 0.7 | 6 |
| TOTALS | 36,963 | 69,636 | 67,153 | | 93,746 |

[1]Of the 75 households in the village, 40 (53%) were sampled.

[2]Pedersen (1987) estimated the number of fish harvested and then converted this to the edible or usable weight of the fish. Because the ratio of usable weight:total weight was not listed, it was necessary to recalculate the number of fish caught and then multiply by total fish weights to determine the total weight of the total harvest.

[3]Derived from Pedersen's conversion factors.

[4]Derived from Colville delta data (Moulton et al. 1986) where possible; otherwise from Table 1.

## Kakt ovik

The village of Kaktovik is located on Barter Island adjacent to the Arctic National Wildlife Refuge. In 1985 the population size was 220.

Several descriptions of fishing activities at Kaktovik are available (Griffiths et al. 1977, Wentworth 1979, Jacobson and Wentworth 1982, Envirosphere 1986) and supplementary information is found in other reports (Furniss 1974 and 1975, USFW 1982, Craig and Schmidt 1982, Pedersen et al. 1985, Stern 1985, ADFG 1986). In addition, USFW and ADFG conducted household surveys to determine patterns of resource use in *1985-86,* but their report was not available in time for inclusion here, except for a sum mary table of fish catches which was provided by S. Pedersen (ADFG).

### Fishery Description

While some fishing may occur year-round at Kaktovik, efforts are greatest during summer months (Fig. 10). Areas currently or formerly fished are widespread, extending along the coast from Prudhoe Bay to Demarcation Bay and far inland on many of the larger North Slope rivers (Figs. 8 and 22). These figures depict the extent of land use by Kaktovik residents over the 60-year period from about 1923 to 1983 (Pedersen et al. 1985). In recent years, most fishing occurs in the vicinity of Barter Island (Fig.23), at several fish camps along the coastline (e.g., Griffin Point), and in the Hulahula River.

The summer fishery is primarily a coastal gillnet effort for arctic char (early in the season] and arctic cisco (later in the season). Fishing occurs around Barter Island, Bernard Spit, and Arey Island during the open water season (June to September) with peak fishing in July and August .

Gillnets are typically 100' long with 5" stretched mesh and are set several feet out from the edge of the shoreline. Some angling also occurs throughout the summer. Average sizes of fish caught in the *1985* summer fishery were 19" *(482* mm) for arctic char and 15" (387 mm) for arctic cisco (Envirosphere *1986).* As mentioned earlier in this report, tagging studies have shown that the char caught at Kaktovik can originate from North Slope streams between the Sagavanirktok and Firth rivers, and that

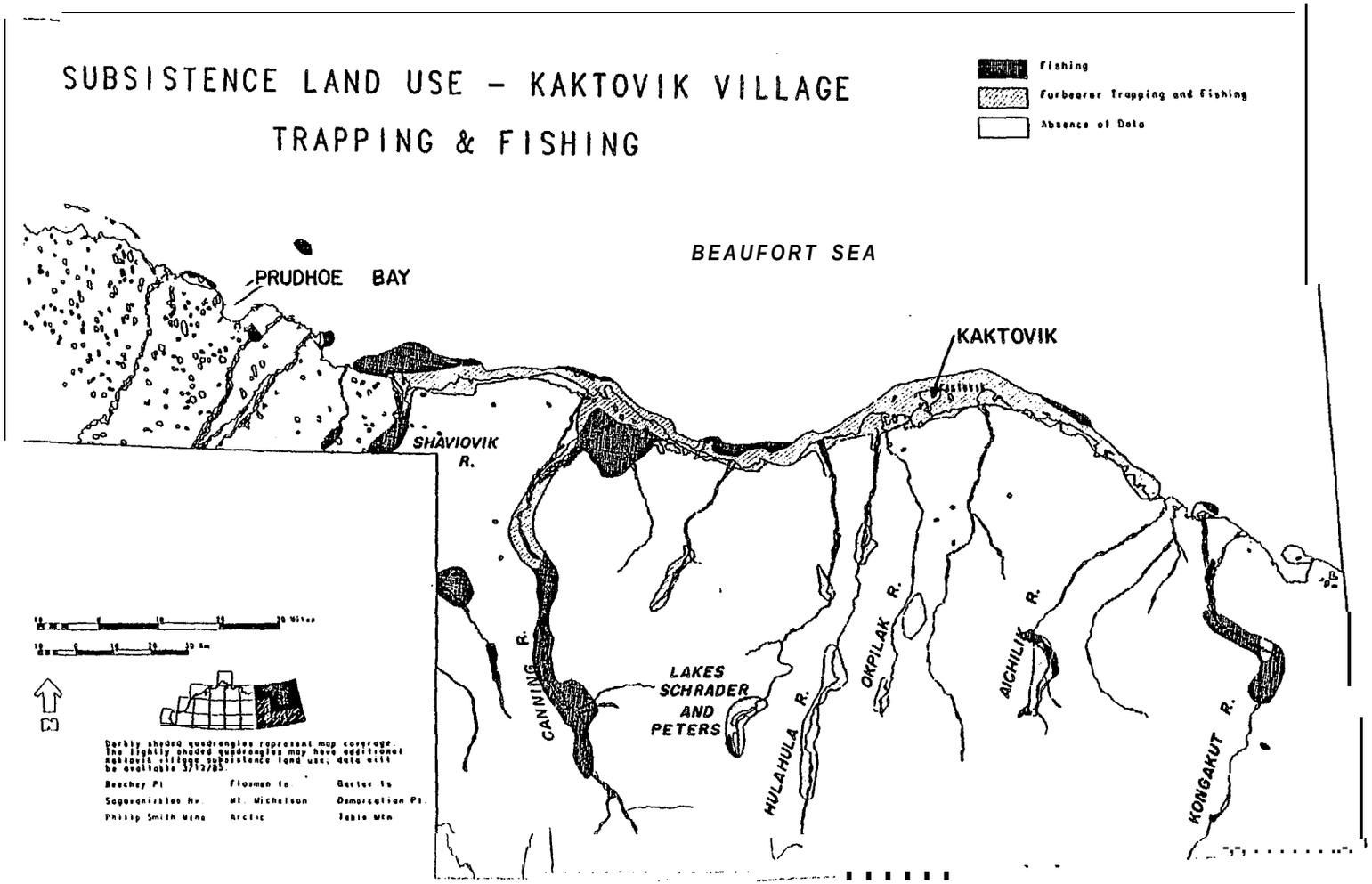


Figure 22 . Kaktovik subsistence use areas for fish. Source: North Slope Borough, Geographic Information System, Anchorage, AK.

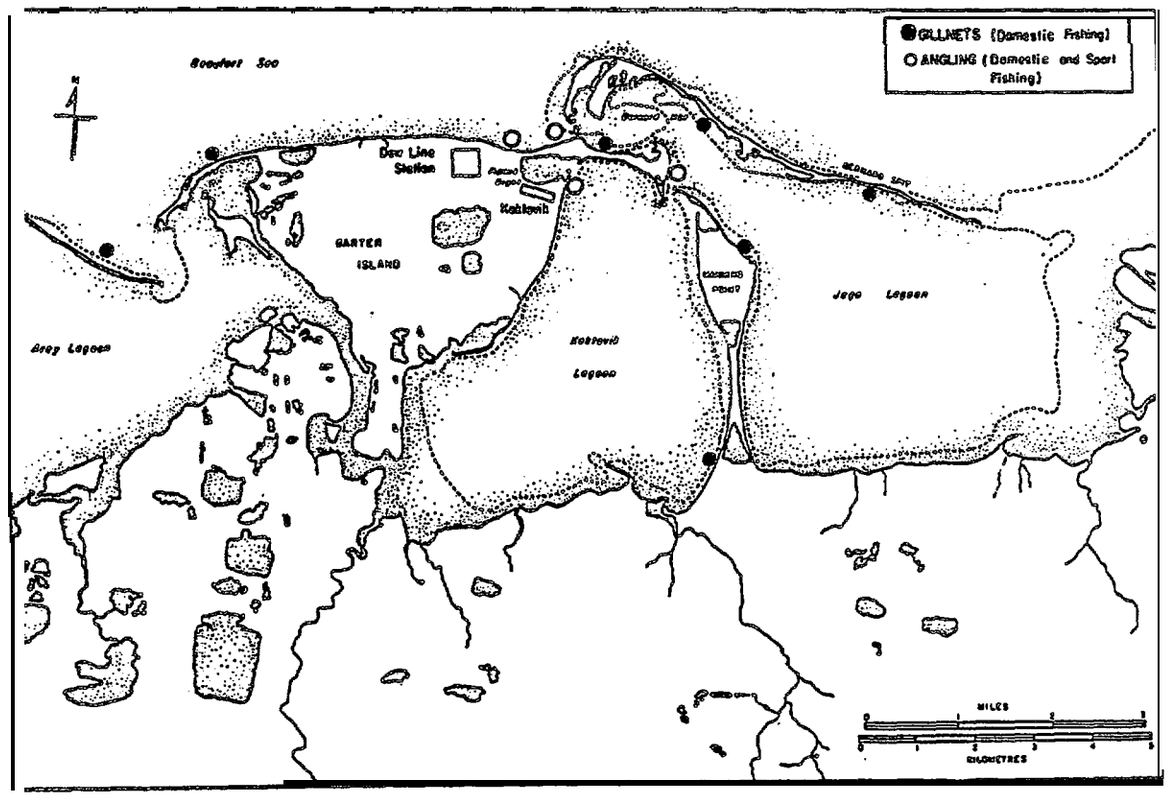


Figure 23. Kaktovik summer fishing sites in the vicinity of Barter Island, 1975. Source: Griffiths et al. 1977.

the arctic cisco are caught during their migrations to or from the Mackenzie River.

Fishing activities are reduced in winter but occur in three general areas. First, the main effort is in the Hulahula River where char are caught at three spawning and/or overwintering sites (Fig. 22). Prior to freeze-up, these fish are caught by seine or angling, and after freeze-up the fish are hooked by jigging lures through holes drilled in the ice. Second, lake trout are caught by jigging in Lake Schrader ("Neruokpuk Lake") in the headwaters of the Sadlerochit drainage. Some of these fish are up to 3' in length and weigh 20 lb, but more typical weights are 4-5 lb. Third, in some winters arctic cod are caught by jigging in coastal waters near the village.

Harvest Quantity

Harvest data for Kaktovik Include annual catch estimates for 1973 (Patterson 1974), 1975 (Griffiths et al. 1977), and 1985 (S. Pedersen, pers. comm.), and a partial estimate for 1985 (Envirosphere 1986). Estimates found in several other reports all use Pattersonrs data (Nielson 1977, Patterson and Wentworth 1977, AEIDC 1978, Stoker 1983, Pedersen et al. 1985, Stern 1985).

Annual catch estimates for the three years were:

| Year | Harvest (lb) | Annual Per Capita Catch (lb) |
|---|---|---|
| 1973 | 21,000 | 105-131 |
| 1975 | 6,500 | *50* |
| *1985* | *12,700* | 58 |

Patterson (1974) based his estimates on interviews with village representatives and estimated that the average catch during 1969-1973 was 15,000 lb dressed weight or 21,000 lb total weight (Table 4). This amounted to about 14% by weight of the total harvest Of subsistence resources and an annual per capita catch of 131 lb of fish. Stoker (1983) used Patterson's figures as the estimated annual harvest over the 20-year period 1962-1982, although he estimated that fish comprised about 22% of

the total harvest of subsistence resources and that the annual per capita catch during this period was 105 lb of fish.

The 1975 harvest estimate was derived by Griffiths et al. (1977) from questionnaires and interviews with Kaktovik fishermen. Only three Kaktovik families responded to the questionnaires, but they represented approximately 40% of the village (population size of 130 in 1975) and 70% of the total fishing activity in 1975. The estimated total harvest that year was about 6500 lb, for an annual per capita catch of 50 lb (Table 9).

Pedersen (1987) based his estimate of the 1985-86 fish harvest on interviews with 42 of the 54 households in Kaktovik. Although his data cover the period from July 1985 to June 1986, the data pertain mostly to 1985 because relatively little fishing occurs from January to June (Fig. 10). The 42 households reported catching 9151 lb of fish (Table 10). An expansion of these data to all 54 households in the village yields 11,700 lb dressed weight or 12,700 lb total weight. The annual per capita catch was thus about 58 lb of fish in 1985.

Envirosphere (1986) also interviewed Kaktovik fishermen in 1985. Based on limited data, Envirosphere suggested that the summer harvest consisted of about 1000-2000 arctic cisco and 2000-4000 arctic char, which would equal 4300-8600 lb of fish using the conversions listed in Table 10.

## DISCUSSION

Two points emerge from this review--fishing is an important component of the Inupiat subsistence economy, and the sizes of the harvests are not well-documented. Although the Inupiat frequently participate in fishing activities (Kruse et al. 1981), fishing has received relatively little attention for two general reasons--it has less cultural significance than hunting (Wilimovsky 19569, and it is an activity that is not as easily quantified as are harvest's of other major resources, particularly large mammals (caribou, bowhead whales).

There are several problems inherent in attempts to quantify fish harvests (AEIDC 1978, ADFG 1986):

1. Methodology. Estimates based on questionnaires or interviews with local residents are often not verifiable,

Table 9. Kaktovik fishery, 1975. Source: Griffiths et al. 1977.

| Location | Species | Kaktovik Fishery in 1975 | | |
|---|---|---|---|---|
| | | Estimate of 1975 Catch | Average Weight/Fish (lb) | Estimate of Total Weight (lb) |
| Kaktovik | Arctic char | 208 | 1.5 | 310 |
| | Arctic cis co | 1,722 | 1.3 | 2,240 |
| | Arctic cod | 1,250 | 0.07 | 90 |
| Grirfin Point | Arctic char and Arctic cisco | 2,000 | 9.4 | 2,800 |
| Hulahula | Arctic *char* | 350 | 1.1 | 390 |
| Lake Schrader | Lake trout | 150 | 4.4 | 660 |
| TOTALS | | 5,680 | | 6,490 |

Table 10. Kaktovik fish harvest based on preliminary data from household surveys, July 1985-June 1986. Source: Pedersen 1987 .

| Fish | Estimated Usable Weight (lb) Subsample[1] | Total | Estimated Total Harvest No. Fish[2] Caught | Weight/Fish[3] (lb) | Total Weight (lb) |
|---|---|---|---|---|---|
| Arctic char | 5,232 | 6,708 | 2,396 | 1.5 | 3,590 |
| Arctic cisco | 3,660 | 4,692 | 6,703 | 1.3 | 8,710 |
| Grayling | 167 | 214 | 238 | 1.2 | 290 |
| Lake trout | 92 | 118 | 30 | 4.4 | 130 |
| Flounder | 0.5 | 1 | | | |
| TOTALS | 9,151 | 11,733 | 9,367 | | 12,720 |

[1]Of the 54 households in the village, 42 (78%) were sampled.

[2]Derived from Pedersen's conversion factors.

[3]Derived from Kaktovik data (Griffiths et al. 1977) where possible; otherwise from Table 1.

and estimates based on on-site monitoring (usually in association with biological studies) may miss catches at remote fish camps or in seasons when biologists are not present.

2. Annual Variability. Harvests vary annually, reflecting changes in fish abundance or changes in fishing effort (e.g., some people may not fish every year if other sources of employment or other game species are available]. Thus, a single year's estimate of the fish harvest may or may not reflect typical conditions.

3. Cultural Considerations. Subsistence use of resources is a culturally significant activity whose value is not measured by quantity alone.

Furthermore, changing patterns of resource use have been noted by some researchers. Nelson (1981), for example, comments about a resurgence in fishing activities at Wainwright. In addition, the steadily increasing population size in North Slope communities (Fig. 24) may also exert an increasing pressure on fish resources. Consequently, pre-1980 harvest levels probably do not reflect current conditions.

Despite these data limitations, it is apparent that fish are an important resource for the Inupiat communities. A rough estimate of the annual harvest (villages combined) is about 210,000 lb of fish, or about 165,000 lb dressed weight (Table 11). Although the total harvest of land and marine mammals is considerably larger than this, it is noteworthy that the utilizable weight of the fish harvest equals roughly 70% of the average harvest of bowhead whales at the same villages: 12 whales (i.e., the average no. of whales landed each year, T. Albert, pers. comm.) x 19,580 lb (i.e., the utilizable weightof each whale, Stoker 1983) = 234,960 lb.

Given the continuing but underrated value of fish resources in modern Inupiat society, it is apparent that updated assessments of fish harvests are needed. For some North Slope villages, the only available information about harvest quantities consists of one rough estimate made 15 years ago.

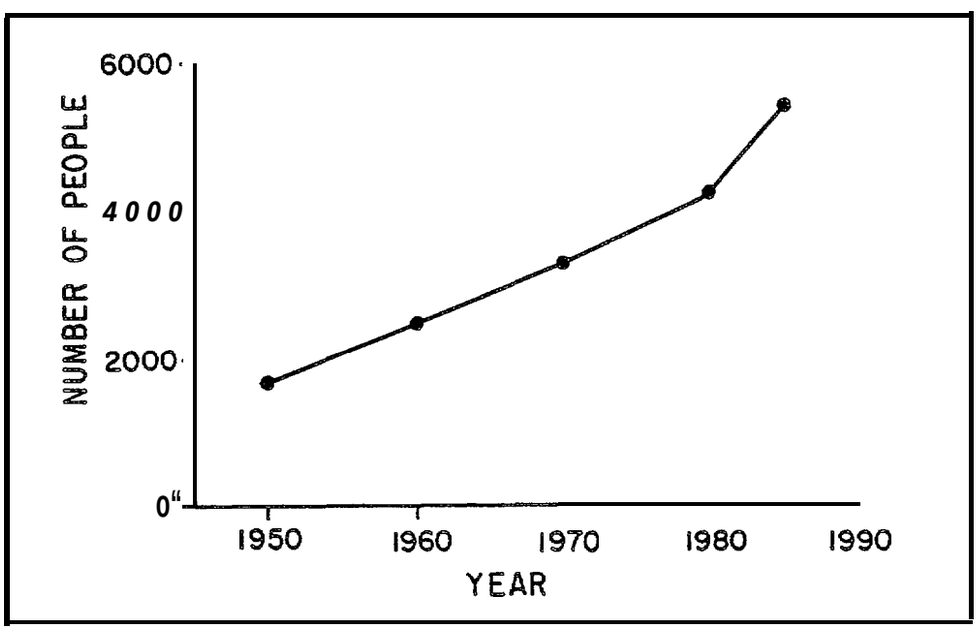


Figure 24. Number of North Slope residents (excluding oil workers in the Prudhoe Bay area). Source: Kruse et al. (1981), and State of Alaska (Dept. Community and Regional Affairs, FY 1986 Revenue Sharing Program).

Table 11. Estimated total harvest of fish at North Slope villages in 1985 (i.e., annual per capita catch x population size).

| Village | Data Year | | 1985[b] Population Estimate | Estimated Harvest in 1985 (lb) |
|---|---|---|---|---|
| | Year | Pcc (lb)[a] | | |
| Barrow | 1973 | 32 | 3,075 | 98,400 |
| Wainwright | 1973 | 9 | 507 | 4,600 |
| Point Lay | 1983 | 4 | 142 | 600 |
| Atqasuk | 1983 | 43 | 248 | 10,700 |
| Nuiqsut | 1985 | 241 | 332 | 80,000 |
| Kaktovik | 1986[c] | 58 | 220 | 12,700 |
| | | | Total Weight | 207,000 |
| | | | Dressed Weight[d] | 165,000 |

[a]Per capita catch (annual).

[b]Source: State of Alaska, Dept. of Community and Regional Affairs, FY 1986 Revenue Sharing Plan.

[c]Preliminary data from S. Pedersen (pers. comm.).

[d]Charlie Brown (pers. comm.) notes that the whole fish (without gut) is often consumed. An average value of 80% usable weight is used here.

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