

**SUBSISTENCE HERRING FISHING IN THE  
NELSON ISLAND AND NUNIVAK ISLAND  
DISTRICTS, 1990**

by

Mary C. Pete

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## ABSTRACT

This report summarizes results of surveys conducted in summer 1990 on the participation rates and harvest levels of herring for subsistence use by communities in the Nelson Island and Nunivak Island districts. The 1990 surveys were prompted by concern over low projected returns of herring to those districts. Communities in the Nelson Island area were surveyed from 1986 through 1988 and results of those surveys are compared with the 1990 findings. This is the first complete survey (100 percent sample) administered in Mekoryuk, the single contemporary community on Nunivak Island. All fishing families were surveyed in four communities. Harvest estimates were generated for a fifth community, Nightmute, which did not give permission to conduct the surveys, primarily because of their concern about the declining herring stocks.

The 1990 survey showed that herring is a central component of the subsistence economy of the communities in the Nelson Island area, as did the previous surveys. A total of 125.7 short tons of herring was harvested and processed for subsistence use by approximately 72 percent of all Nelson Island households. Mekoryuk families, including 59 percent of all households harvested substantially less herring than the Nelson Island families: 4.5 short tons or 46 pounds of herring per capita compared to 222 pounds per capita for the Nelson Island communities combined. Drying the consistently fat herring caught along Nunivak Island involves much time and labor.

The 1990 total harvest was the second lowest for Nelson Island residents since 1986, and the lowest for Toksook Bay and Newtok. It was also the lowest per capita harvest (222 pounds) since documentation began with the 1986 fishing season. Evidence of recent declines in herring stocks have been compared to shortages in the 1960s and 1970s. Current projected declines understandably cause concern. Some families have begun to make adjustments by increasing harvests of other, less-preferred types of fish.

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## INTRODUCTION

This report presents results of subsistence-herring harvest surveys administered in summer 1990 in three Nelson Island area communities and Mekoryuk on Nunivak Island (Fig. 1). Herring harvest estimates for a fourth Nelson Island community are also included. The 1990 findings are compared with results of surveys in the Nelson Island area communities conducted from 1986 through 1988. Surveys were conducted to document the level of subsistence use of herring by those communities, monitor the effects of the commercial herring sac-roe fishery initiated in 1985, and annually estimate the subsistence-herring harvest. Special attention was directed at local observations of the 1990 subsistence-herring fishing season, which supported management concerns about depressed herring stocks.

Herring comprise a significant part of the economy of communities along the eastern Bering Sea coast, particularly in the Nelson Island area (Fienup-Riordan 1983; Hemming, Harrison, and Braund 1978; Pete 1984; Pete and Kreher 1986; Pete, Albrecht, and Kreher 1987; Pete 1990). Herring stocks in both the Nelson and Nunivak Island districts were projected to be below thresholds to allow commercial harvest in 1990 (Hamner 1989); these projected low returns motivated the 1990 survey. Concern about subsistence productivity, even if commercial harvest was prohibited, required in-season surveys. The low projections were borne out in the Nunivak Island district. A surplus of 205 short tons was observed in the Nelson Island district in 1990 (Alaska Department of Fish and Game 1990). Commercial openings were announced in the Nelson Island district, but no herring were sold as buyers did not register for the district, anticipating the low returns.

## METHODOLOGY

The survey in Newtok, Tununak, and Toksook Bay was administered following previous methodologies (Pete and Kreher 1986; Pete, *et al.* 1987; Pete 1990). Letters were sent to the Nelson Island communities and Mekoryuk in early May asking for permission to administer surveys and



recommendations for local assistants. All communities, except one, Nightmute, agreed to participate. Household censuses were updated with city officials upon arrival. Harvest information collected was similar to that recorded in previous surveys; harvest estimates were generated from direct observation of herring on drying racks. Detailed information on fishing sites, timing of harvest, specific personnel involvement, roe-on-kelp collection levels, and gear used was collected from several key respondents in each community. Participation in subsistence-herring production by every household was noted.

Nightmute officials did not grant permission to conduct the survey in their community in 1990, offering that the importance of herring to their economy has been well-documented in previous surveys. If policy developers were still not convinced about the significance of herring to protect local herring stocks, they did not think another year of information would "make them any more wise or concerned." It is a traditional Yup'ik belief that undue attention to resources in trouble hastens their downturn and eventual demise. This belief was expressed when permission for conducting a survey was denied. Human intervention in ordering of natural resources and attempting to manage them is viewed as presumptuous and arrogant. Wild resources are known to make themselves scarce to remind humans of their equal footing with them, especially when humans make inordinate commotion over wild resources. When resources face difficult times, it is considered more appropriate to deliberate and act on what human behavior and interaction should be changed to improve the situation. Nightmute officials wanted their views of the issue communicated in this report.

The harvest estimates for Nightmute were derived with a different methodology. The household census was updated as much as possible with the assistance of Nightmute residents fishing in Toksook Bay. With permission, direct observation was made of drying racks of two Nightmute families who fished from Toksook Bay. Fullness estimates of racks of seven families that fished from the fish camp at Umkumiut were made. Lastly, average harvests from previous surveys of four families that were identified as having fished from Nightmute were used to arrive at complete harvest information for all Nightmute families that fished for herring for subsistence in 1990. Because of this non-standard methodology, Nightmute population and herring-harvest figures used in this report should be interpreted more cautiously than the other community estimates.

This was the first year since 1986 that any subsistence-herring harvest information for Mekoryuk has been collected (Pete 1990). More importantly, this is the first survey in which a complete (100 percent) sample of Mekoryuk herring fishing households were contacted. Initial work included updating a household census on file with the city and determining the most common local unit of herring harvest, which were 15-gallon tubs. In addition to household participation, harvest levels, methods of herring processing, information on harvest timing, areas fished, gear used, and harvest of herring roe-on-kelp was collected. Many residents offered information on current herring productivity compared to the recent past (ca. early 1980s).

## COMMUNITY CHARACTERISTICS, 1990

### Nelson Island District

Detailed descriptions of the Nelson Island area communities were included in previous survey reports (Pete and Kreher 1986; Pete *et al.* 1987; Pete 1990). Briefly, the regional population of communities in the study represent the majority of the current *Qaluyaarmiut* Yup'ik society, one of approximately 20 traditional Yup'ik kin-based societies that generally share a land use area with unique patterns of resource use, often speak a distinctive linguistic dialect, and form a marriage universe (Fienup-Riordan 1983; Shinkwin and Pete 1984; Andrews 1989). The communities are small, most permanent residents (approximately 98 percent) are Yup'ik Eskimo, and many elderly people speak only the Yup'ik Eskimo language.

The 1990 regional population increased by 2 percent and the number of households increased by 4 percent since 1988 (Table 1) (Pete 1990). Most of the increase was due to natural growth. Average household sizes were typically large, ranging between 4.9 to 6.0 persons per household. Toksook Bay and Tununak gained residents while Newtok was reduced by two people since 1988 for an overall estimated 1990 regional population of 1,134 people (Table 1). There was some inter-village

migration due to marriage, as well as some, but less, movement for jobs to Bethel, the regional trade and transportation center.

The communities continue to rely heavily on local wild resources, with seasonal employment and commercial fishing providing the major opportunities for monetary income. The reduction in 1989, and the eventual lack of a commercial herring sac-roe fishery in 1990, was expressed as a loss of an important source of income. The commercial herring sac-roe fishery was estimated to contribute up to one-third of average annual household incomes in highly productive years (Pete 1990).

TABLE 1. NELSON ISLAND AND NUNIVAK ISLAND POPULATION AND HOUSEHOLD PARTICIPATION IN SUBSISTENCE-HERRING PRODUCTION, 1990

Community	Population	Total number of households	Average household size	Number of participating households		Number of fishing families
<u>Nelson Island</u>						
Newtok	205	39	5.3	20 (51%)		12
Tununak	326	67	4.9	54 (81%)		37
Toksook Bay	440	82	5.4	60 (73%)		38
Nightmute <sup>a</sup>	163	27	6.0	18 (67%)		13
Subtotals	1,134	215	5.3	152 (71%)		100
<u>Nunivak Island</u>						
Mekoryuk	192	56	3.4	33 (59%)		19
Totals	1,326	271	4.9	185 (68%)		119

<sup>a</sup>Figures for Nightmute were derived from key respondents from Nightmute fishing at Toksook Bay and Umkumiut, rather than from interviews in Nightmute.

## Nunivak Island District

Nunivak Island, measuring roughly 60 miles from east to west and 35 miles north to south, lies approximately 20 miles from the mainland across Etolin Strait (Fig. 1). A significant anthropological study of *Nunivaarmiut* (societal name for Nunivak Island Eskimos) conducted in 1939-40 by Lantis (1946) found 203 people in seven year-round settlements located around the entire coastline of Nunivak Island. Lantis noted seven other recently abandoned (ca. 1900) settlements, with many structures, being used as summer camps, along with numerous other camp sites. Consolidation from 14 to 7 settlements probably occurred after disease epidemics in the 1800s and early 1900s (Wolfe 1982). In the 1950s, most families with school-aged children in settlements around Nunivak Island congregated at Mekoryuk, along the northeast shore, after a new school was built there. Mekoryuk is the only current permanent community on Nunivak Island.

During the late 1930s, resources harvested for food and materials were four species of hair seal, walrus, beluga, sea lion, three species of Pacific salmon, halibut, Pacific cod, saffron cod, wolf fish, Dolly Varden, herring and herring spawn-on-kelp, stickleback ("needlefish"), smelt, several species of whitefish, "dogfish" (a species of shark), numerous types of shellfish and marine invertebrates, several species of flounder and sculpin, many species of waterfowl and sea birds and their eggs, ptarmigan, arctic and red fox, mink, weasel, reindeer (formerly caribou, until they were decimated and reindeer were introduced), and an occasional polar bear and dolphin (Lantis 1946). Many plant species and driftwood were also collected. Most of these species were still harvested and used in 1990, with the addition of introduced muskox. Mekoryuk residents still travel throughout the entire island and its coastal waters to hunt, fish, and gather wild resources.

In 1940, herring harvest and use was not large, compared to many other species taken throughout the island (Lantis 1946; Pete 1984). However, herring were more numerous on the east and south coasts of Nunivak Island (Lantis 1946:164), and specific settlements in the area not documented by Lantis may have incorporated greater use of herring for subsistence. The author spent most of the study year in communities along the north coast (Lantis 1946). Other subsistence studies

since Lantis' work have been done in Mekoryuk (Nowak 1975a, 1975b, 1977), but information on herring use was not described.

Many Nunivak Island families had moved to Bethel or other points beyond since the 1950s, to prevent families splintering when children were of high school age, because boarding schools were the only option until the mid-1970s. Some families and their descendants moved back to Mekoryuk after a local high school was built in the late 1970s, or established a pattern of returning to the island in the summer to fish for salmon, halibut, Pacific cod and herring. There is a strong and binding network of ties among former Nunivak Island families and their resident relatives expressed and strengthened by exchanges of subsistence labor and products. This dynamic adaptation is an important feature in family subsistence patterns and deserves attention in any discussion of the current Nunivak Island subsistence economy.

Mekoryuk had 192 permanent residents in 56 households in 1990 (Table 1). Most (95 percent) people were Cup'ik Eskimo (*Cup'ik* is the dialect of Yup'ik spoken by *Nunivaarmiut* society). As with other rural communities in western Alaska, the economy in Mekoryuk is based on harvest and use of local fish and wildlife combined with limited opportunities for wage employment, and commercial herring sac-roe and halibut fishing. The few available permanent jobs are generally associated with governmental services, such as with the school, local governments, and the regional health and social service agencies. Some seasonal jobs in the community are available, such as reindeer herding and butchering, and sports guiding and transporting of muskox hunters. Other wage employment opportunities include seasonal work outside of the community, such as construction or fish tendering and processing.

Cost of living is high due to the expense of importing goods and services. Barge service is the primary channel for incoming materials. Few airlines provide regular service to Mekoryuk because of the relatively small market and more stringent regulations required for flying over expanses of water such as Etolin Strait.

In the spring and summer of 1990, the Native corporation replaced a reindeer-processing plant that burned down several years ago. In July 1990, it was used to hold commercially-caught halibut for

export in cold storage, an application of the facility which increased local involvement and production in the commercial halibut fishery. Previously, Mekoryuk fishermen had to transport their catch to Toksook Bay or Tununak, the nearest ice-machines. In fall and winter, the plant will serve its designed purpose, which is a facility for reindeer butchering and storage prior to transporting meat to regional markets.

The commercial herring sac-roë fishery essentially did not occur in the Nunivak Island district in 1989 and 1990, primarily due to low returns of herring (Alaska Department of Fish and Game 1990). As with Nelson Island residents, the loss of this income opportunity has had negative effects. Fishermen feared foreclosure on many loans to purchase fishing equipment. Time spent preparing for subsequent non-existent commercial openings competed with other pursuits, such as subsistence-herring fishing and sea mammal hunting.

#### SUBSISTENCE-HERRING FISHING, 1990

##### Nelson Island District

Harvest and production of herring for subsistence use by Nelson Island area residents has been described in detail in previous reports (Pete and Kreher 1986; Pete *et al.* 1987; Pete 1990). The subsistence fishery was executed in essentially the same manner in 1990. Gear used and areas fished were similar to those reported earlier. Briefly, boats used were locally made wooden or purchased aluminum skiffs 14 to 28 feet in length; gill nets of between 2 to 2-3/4 inch mesh and 60 to 300 feet long were set; and areas fished were traditionally productive sites located near communities.

Production activities were organized and managed usually by a couple in charge of extended-family-based work groups. Generally, men oversee and engage in fishing and women take care of processing and storage. Extended families involving members of more than one household and many individuals with a wide age range cooperated in production activities.

In Tununak, gill nets were usually set as soon as the adjacent shoreline was ice free and herring were present in appreciable numbers in traditional fishing areas, a time span from mid May to early June. The other communities waited until rivers were clear of ice (Newtok and Nightmute) or subsequent runs of herring, noted for lower oil content, arrived (Toksook Bay). Thus, fishing generally occurred from mid May through mid June around Nelson Island.

The 1990 subsistence-herring season was unusual; subsistence fishing for herring resulted in differential success depending on timing of harvest and the area fished. Fishing families made adjustments to the prevalence of fatty herring throughout the entire season, and fewer herring congregated in schools of highly variable sizes. They fished longer and tried different meshed-sized nets to get herring for subsistence.

In 1990, Tununak families fished from late May through second week of June. Toksook Bay and Newtok families fishing activities extended from early June through late June. Reasons for the longer fishing season were related by respondents to poor returns and unusual quality of herring.

Herring were plentiful early in the 1990 season along the north shore. Tununak families did not have much difficulty obtaining as much herring as they wanted with regular gear because they customarily fish early in the season. However, in 1990, many more herring were unusually fat. Each year fishermen and processors make note of the oil content of herring as it affects spoilage. Spoilage is of particular concern in late June when weather is generally more sunny and windless, especially along the south shore of Nelson Island.

The greater proportion of strings of herring (*piirat*) processed as *ullipengayiit* in 1990 indicated the high oil content of herring caught for subsistence (Table 2). This means that more herring were subject to spoilage if suitable weather did not prevail. *Ullipengayiit* (plural; *ullipengayaq*, singular) means "those that are cut and exposed to the air." It refers to oily herring filleted and spread open for the oil to bead up to form a pellicle before braiding into strings to dry. Less fatty herring are processed into *tamalkuryat*, meaning "those that are whole (i.e. not filleted and exposed to air)," and are gutted and immediately braided into strings (Pete and Kreher 1986; Pete *et. al* 1987). In the 1990 season, 25 percent of all strings of herring were processed as *ullipengayiit* on Nelson Island, compared to regional

averages of 11.0 to 19.8 percent of all strings in 1986-88 (Table 2). In Tununak specifically, 28 percent of the 1990 catch was processed as *ullipengayiit* (Table 2).

TABLE 2. TOTAL STRINGS OF HERRING PRODUCED FOR SUBSISTENCE USE AND PERCENTAGE OF TOTAL STRINGS PROCESSED AS *ULLIPENGAYIIT* BY NELSON ISLAND RESIDENTS, 1986-88 AND 1990<sup>a</sup>

Community	1986		1987		1988		1990	
	Total No. of Strings	Percent <i>ullipe- ngayiit</i>						
Newtok	503	7.0	463	8.0	618	18.0	351	16.2
Tununak	2,615	17.0	2,331	17.0	2,537	27.0	2,441	28.0
Toksook Bay	2,779	7.0	2,348	9.0	2,998	14.6	2,040	23.0
Nightmute	1,032	7.0	758	4.0	906	16.9	no data	
Totals	6,929	11.0	5,900	13.0	7,059	19.8	4,832	25.0

<sup>a</sup>Total numbers of strings vary slightly for some communities from previous reports (Pete and Kreher 1986; Pete *et al.* 1987). The numbers reported here are the final adjusted figures and percentages.

Newtok and Toksook Bay families experienced an even more difficult season in 1990 than Tununak families, which was further exacerbated by low gasoline supplies and unprecedented high prices (\$5.00 per gallon). As mentioned, fishermen in both communities typically fish later than Tununak fishermen. Newtok fishermen have to wait for ice to break up in the Keyalivik River, which is their sole access to Hazen Bay. Toksook Bay (and Nightmute) families prefer to fish later in the season, when less-oily herring usually arrive in proportionately greater numbers. In 1990, herring abundance unexpectedly dropped off dramatically during mid June in the Nelson Island area, although there were slight periodic increases throughout late June along the south shore. Furthermore, the

reduced numbers of herring later in the season included a prevalence of fatty herring, rather than less oily herring which can be more reliably dried in late June.

Herring sizes were highly variable in all runs; large and small, or different age-classes, were mixed together. Generally, younger herring are smaller and less oily, so fishermen targeting these to catch set nets of smaller mesh size -- usually 2-inch stretched mesh. In 1990, even the 2-inch mesh nets caught mostly small oily herring. Nets with different mesh sizes, including mesh as small 1-1/4 inch and as long as 300 feet were strung together and set. After trying to use nets with different mesh sizes, some families suspended fishing until later in hopes of getting leaner herring. Large numbers of less oily herring never arrived.

Several families did not fish for herring at all, resulting in the lowest overall household involvement in herring production in the years of the survey. Instead, they diverted efforts to increase halibut, Pacific cod, and salmon harvests, filling drying racks and freezers with these welcome, but less-preferred, alternatives. Local residents do not consider halibut, Pacific cod adequate, or even improved, substitutes for herring, as non-local people may, but these species certainly are preferred by Nelson Island families to non-local, imported foods. Herring is the traditional winter food for Nelson Island families. Changing subsistence fishing strategies often means purchasing new gear and more gasoline, adjusting processing and drying facilities, investing more time fishing for other species, and altering subsistence production roles in the family.

Many respondents interpreted the unusual characteristics of the 1990 herring season as an indication of decreasing stocks. Some of these disturbing signs had been observed previously in herring stock reductions during the 1960s and 1970s, such as abundance of fatty herring, shorter duration of runs, and localization and concentration of spawning schools along Cape Vancouver and the north shore of Nelson Island (Pete 1990). However, there were some differences. Respondents viewed the recent trends with more alarm. Nelson Island herring stocks may have not experienced full recovery from earlier shortages before current relapses. In earlier times of shortage, herring were uniformly large one year, and then decreased in size the next year. The mixed sizes and high oil content of herring throughout the 1990 season were believed to show that herring numbers may be in a more

drastic decline in comparison to the declines in the 1960s and 1970s. Different-sized herring (age-classes) were thought by local residents to be mixing because there were too few numbers to sustain large enough schools for normal spawning saturation as discrete age-classes. Fewer herring with less competition for the abundant food have become uniformly fat. Consequently, 1990 the subsistence-herring fishery was distinctly stressful and unusual.

### Harvest Levels

The total 1990 harvest of herring for subsistence by Nelson Island communities was an estimated 125.7 short tons (Table 3), the second lowest recorded total harvest since 1986 (Pete 1990). The 1990 harvest produced the lowest per capita pounds of herring for the regional population and for Toksook Bay and Newtok (Fig. 2), the communities which fished later than Tununak. Regional per capita pounds of herring harvested ranged from 227 to 308 pounds in 1986-88; in 1990, the regional harvest produced 222 pounds of herring per person for subsistence. Nightmute figures do not show any unusual reductions. However, Nightmute estimates were not generated from direct observation, thus interpretations should be made with caution.

For the first time since 1986, the harvest by Toksook Bay residents was lower than the harvest for Tununak -- 46.3 short tons compared to 54.0 short tons, respectively. In previous years' surveys, harvest levels by Toksook Bay families usually accounted for over 40 percent of the total regional harvest while the harvest by Tununak families accounted for between 36 to 38 percent. Their contributions were reversed in 1990; Tununak harvested 43 percent of the total regional harvest while Toksook Bay obtained 37 percent of the total (Table 3) (Pete 1990). Newtok harvest levels were the lowest documented: 6.3 short tons was obtained in 1990, compared to a range of 10 to 12.6 short tons in 1986-88 (Pete 1990).

Household participation rates for Toksook Bay were likewise the lowest recorded since 1986: 73 percent of all households were involved in production of herring for subsistence use, rather than 83 percent. Although the usual percentage of Newtok and Nightmute households participated in

TABLE 3. ESTIMATED NELSON ISLAND AND NUNIVAK ISLAND SUBSISTENCE-HERRING HARVEST LEVELS (IN SHORT TONS) AND PERCENTAGE OF TOTAL HOUSEHOLDS INVOLVED IN PRODUCTION, 1986-88 AND 1990

Community	1986		1987		1988		1990	
	Short tons	Percentage of households involved	Short tons	Percentage of households involved	Short tons	Percentage of households involved	Short tons	Percentage of households involved
<u>Nelson Island</u>								
Newtok	12.6	46	10.0	56	12.5	68	7.9	51
Tununak	63.3	86	48.0	85	49.3	86	54.0	81
Toksook Bay	69.5	83	51.0	83	58.5	84	46.3	73
Nightmute	21.4	64	15.0	65	16.0	74	17.5 <sup>a</sup>	67
Subtotals	166.8	75	124.0	76	136.3	80	125.7	72
<u>Nunivak Island</u>								
Mekoryuk <sup>b</sup>	no data		no data		no data		4.5	59
Totals							130.2	69

<sup>a</sup>Figures for Nightmute were derived from a combination of methods, rather than interviews with families in Nightmute or direct observation of all herring they processed.

<sup>b</sup>Herring harvest data from 1986 for Mekoryuk are incomplete and have been omitted (Pete 1990).

subsistence-herring production in 1990, a few families (cooperative multi-household units) in both communities that usually fish for herring for subsistence use did not do so in 1990. As mentioned, they chose to put their time and effort into catching and processing other types of fish for their subsistence. However, even with reduced involvement by households and fishing families, a substantial percentage

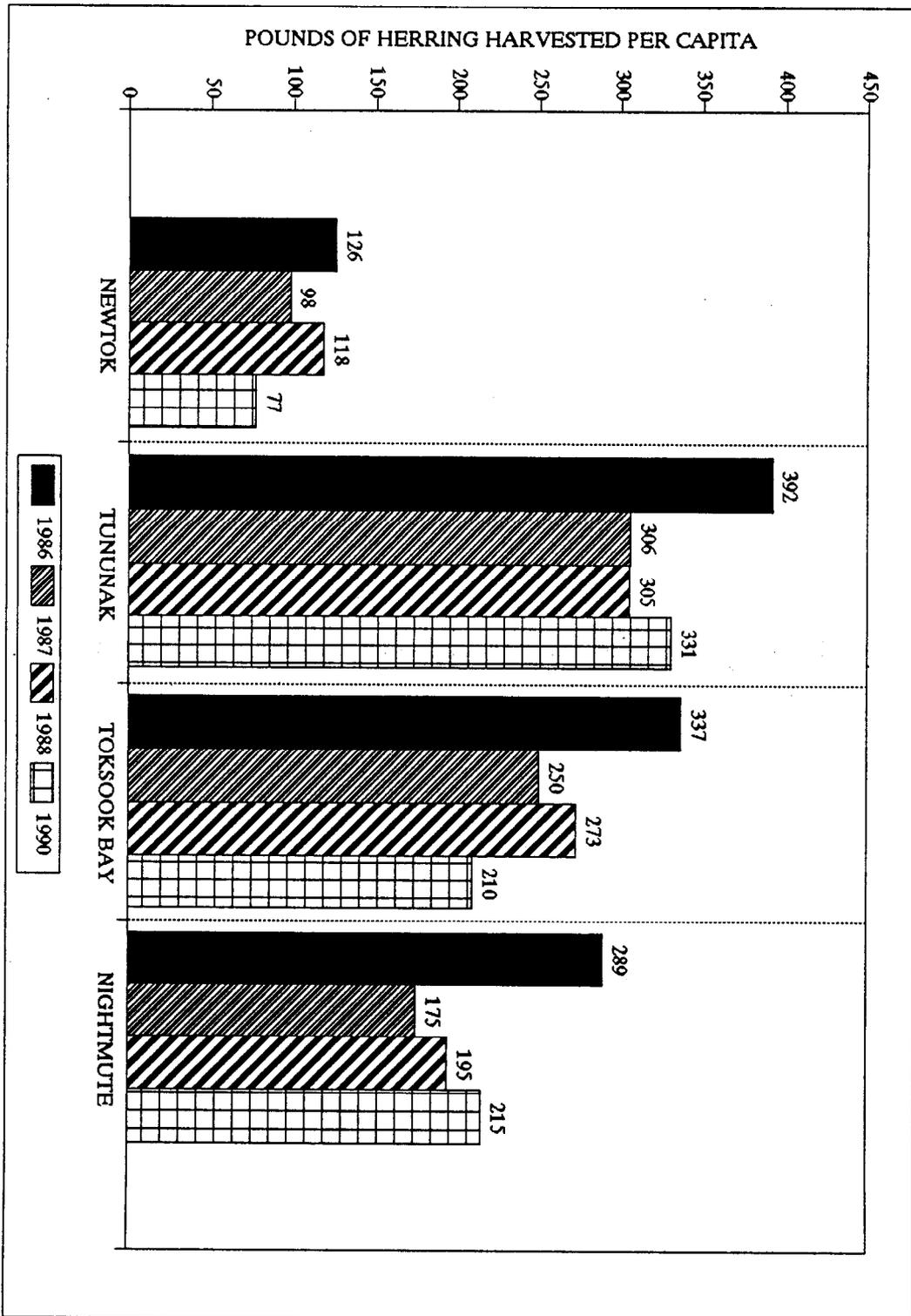


Figure 2. Pounds of herring harvested per capita for subsistence use by Nelson Island communities, 1986-88 and 1990.

(72 percent) of total households continued to be involved in subsistence-herring production (Table 3). This underscores the importance of herring as a subsistence resource to Nelson Island families.

#### Nunivak Island District

Timing of subsistence-herring fishing on Nunivak Island is similar to that reported for Nelson Island. Herring are harvested from mid May to mid June. Most commonly, gill nets were set or "drifted" for herring with skiffs similar in size to that described for Nelson Island. Other methods of harvest included using dipnets, picking herring by hand from tidal pools or throwing home-made "toss nets," approximately six feet in diameter, over spawning schools and pulling them closed and ashore with the "purse" full of herring.

Set and drift net fishing areas commonly used extended east and south from Mekoryuk to Cape Corwin (Fig. 1). In 1990, most nets were set off of Cape Etolin and in the Cape Manning area, between Ikathleewik Bay (*Iqalivik*, meaning "place to get many herring") and Nooravloaksmiut Island (*Nuugavluarmiut*, "inhabitants of *Nuugavluar* (big bluff)," name for a campsite derived from of the place name of the coastal headland). Herring spawn-on-kelp was collected from the same areas. One family boated across Etolin Strait to the area west of Umkumiut on Nelson Island to get herring because they missed the unusually short window of harvest opportunity around Nunivak Island.

Although herring is harvested from camps along the east shore of Nunivak Island, all herring is brought to Mekoryuk to be processed. Processing of herring was similar to methods used by Nelson Island residents (Pete and Kreher 1986; Pete *et al.* 1987), with a few significant differences. Herring caught around Nunivak Island are noted to be consistently large and fat every year, requiring more specialized processing than most herring caught around Nelson Island. Unlike the Nelson Island pattern, herring were not aged in pits. They were immediately deheaded and filleted with a knife through the back, rather than the softened ventral side. Herring were then braided through a section of backbone left near the tail, with locally collected beach grass into short strings of 15 to 40 herring each. The strings of herring were dipped in tubs of sea water to wash off slime and to add salt for taste

and good drying. These strings were hung up to dry on racks with other fish or sea mammal meat. When dry, the strings are moved into smokehouses to be smoked with green willow and driftwood, a step rarely taken by Nelson Island herring fishing families. Smoking prevents the fat from turning rancid, increasing sustained palatability and storage life. The strings of herring were stored along with other dried products in caches for the winter.

Key respondents noted the labor-intensive process as one of the reasons Nunivak Island people did not specialize in subsistence-herring production. Smoking of herring is viewed as an extra, but necessary, step in subsistence-herring processing. Precious wood has to be gathered and cut (Nunivak Island is treeless tundra). The smoke has to be tended for several days to over one week. Other fish, even salmon, are rarely smoked, because they are generally not fat (salmon are caught primarily near spawning grounds). Halibut, Pacific cod, and salmon, can be dried at fish camps without smoking. A few individuals thought that eating too much smoked products reduced endurance, a desired condition for walking throughout Nunivak Island to pursue subsistence activities.

Although harvest of herring spawn-on-kelp by Mekoryuk residents was not documented, it is believed to be considerable and may rival herring harvests in some years. Herring spawn-on-kelp not eaten immediately is frozen or dried for later use. The dried product is easily reconstituted by soaking it in salt water overnight.

As in Nelson Island, production of herring for subsistence use was a kin-based operation in Mekoryuk, with members of extended families, generally a couple and their adult children in separate households, working together. Five former Nunivak Island families now living in Bethel customarily return to the island to produce herring for subsistence, as they had in 1990. The herring products are divided among relatives that helped with production. The majority of harvesters were men, but relatively more women fished for herring than was documented in Nelson Island communities. Women generally helped their husbands or picked herring from tidal pools near Mekoryuk. Most people (90 percent) involved in subsistence-herring production were between 25 and 70 years of age; no one under 18 years of age was involved in 1990.

The commercial herring sac-roë fishery initiated in 1985 brought heightened attention to the health of local herring stocks. Mekoryuk respondents noted that herring numbers have been decreasing since the mid-1980s. As around Nelson Island, herring do not stay in area waters as long as they had in the past. Herring also are used for bait in subsistence-halibut and Pacific cod fishing; fishermen who drift for herring for bait noticed reduced schools that did not stay near shore as long as expected. Smaller numbers of herring make it more difficult to see "oiled" water surfaces which signal when vast schools have moved inshore to spawn. It has become confusing to gauge when herring fishing or spawn-on-kelp collecting activities should start or to plan for expected productivity. Depth or amount of roe deposited on kelp has become highly variable, according to local observations, affecting collecting activities as well. Similar to Nelson Island, two families that usually fish for herring for food did not do so in 1990; they concentrated on halibut and Pacific cod fishing.

#### Harvest Levels

Although subsistence herring production by Mekoryuk families is not of the same magnitude as Nelson Island families, a significant proportion (59 percent) of Mekoryuk households were involved in subsistence-herring production in 1990. Three households provided only harvesters; 14 households had members who only processed herring; and 16 households had members who engaged in both harvesting and processing of herring for subsistence use. Thirty-three households cooperated in 19 fishing families to produce an estimated total of 4.5 short tons of herring for subsistence (Table 3), approximately 46 pounds per capita. Family harvests ranged from 35 to 900 pounds for an average of 470 pounds of herring per fishing family. Previous incomplete surveys documented up to .7 short tons harvested by Mekoryuk residents (Pete 1990).

Nearly 1,000 pounds of processed herring were destined for Bethel, to be taken by five families who moved to Bethel from Nunivak Island. Families estimated amounts for herring to be taken to Bethel, based on past patterns, as well as the current harvest. Bethel-based families conducted fishing and processing activities out of Mekoryuk or camps along the east shore of Nunivak Island, in some

cases, using local relatives' facilities. Thus, approximately 4.0 short tons was harvested for Mekoryuk families in 1990.

Many households involved in herring fishing reported that they also usually collected spawn-on-kelp. A few households said that they commonly only collected spawn-on-kelp; they did not fish for herring. Most respondents noted that very little good quality spawn-on-kelp was found near Mekoryuk in 1990. As mentioned, harvest levels of spawn are thought to be considerable. It is suggested that future surveys incorporate herring spawn-on-kelp harvesting activities and harvest levels.

### SUMMARY

Concern about reduced herring stocks in the Nelson and Nunivak Island districts in recent years prompted in-season subsistence harvest surveys in 1990. The commercial herring sac-roe fisheries in the Nelson and Nunivak Island districts were reduced in 1989 and did not occur in 1990.

The 1990 subsistence-herring surveys in Nelson Island area communities demonstrated the significance of herring harvest levels as in previous surveys. Approximately 126 short tons was harvested -- the second lowest recorded harvest since 1986, and the lowest for Toksook Bay and Newtok. Furthermore, the 1990 harvest reflected the lowest per capita harvest of four study years. This was the first complete herring harvest survey of Mekoryuk households. They obtained an estimated 4.5 short tons. Household participation rates in subsistence-herring production were substantial in all communities, ranging from 51 percent in Newtok to 81 percent in Tununak (Table 1).

This summer, many local observations of herring runs paralleled those made of decreasing herring stocks in the 1960s and 1970s. However, there were observable distinctions in the 1990 season which may signal more radical declines in local herring stocks. Herring schools of mixed sizes and oily herring in sustained numbers occurring throughout the entire season were the most alarming characteristics on the 1990 season.

Declining numbers of herring and proportionately greater numbers of oily herring throughout the entire season affected fishing activities, especially those of Toksook Bay and Newtok families.

Several families on both Nelson and Nunivak islands did not fish for herring this year due to a prevalence of fatty herring, perceived declines in herring numbers, and variable productivity. These families concentrated efforts for winter food on increased harvests of halibut, salmon, and Pacific cod. Augmenting harvests of other fish species was a strategy used in previous herring shortages during the 1960s and 1970s (Pete 1990).

Nightmute officials chose not to authorize the community survey in 1990, with reasons related to current herring declines. As mentioned, they believe that policymakers have enough evidence about the local significance of herring to make reasonable decisions. A traditional Yup'ik belief that inordinate attention directed at shrinking natural resources by presumptuous humans often results in further deterioration of wild resources. Deliberate hastened declines are sometimes effected by natural resources to remind humans of their place with natural resources. Rather than heightened absorption with diminishing herring numbers, they suggest that affected groups of people consider their interactions among themselves relative to the herring resource. Perhaps some of these interactive patterns need to be changed to help the Nelson Island herring resource. They wanted this message conveyed to policymakers, instead of usual survey results.

There is widespread local concern for the Nelson and Nunivak Island herring resources, especially among Nelson Island families, whose main winter food is dried herring. Herring importance in the Nelson and Nunivak Island districts was underscored with its commercialization, because opportunities for wage employment are few and cost of living is high. These recent decreases in herring stocks remind Nelson Island people of past shortages and associated difficulties, which they hope can be avoided. They want to see policies in place that ameliorate the situation soon before declines in herring abundance force subsistence closures.

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