

SUBSISTENCE HERRING FISHING IN THE  
NELSON ISLAND AND NUNIVAK ISLAND  
DISTRICTS, 1992

by  
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Technical Paper No. 221

Alaska Department of Fish and Game  
Division of Subsistence  
Juneau, Alaska

December 1992

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## ABSTRACT

This report summarizes results of subsistence herring harvest surveys conducted in five communities in the Nelson Island and Nunivak Island districts in 1992. Results are compared with five years of survey data, 1986-88 and 1990-91. Surveys in the 1980s were initiated to document the subsistence herring fishery on Nelson Island when local commercialization on those stocks began. Surveys since 1990 have been prompted by poor returns of herring to both the Nelson Island and Nunivak Island districts and a concern for adequate opportunities for subsistence herring fishing.

In 1992, a total of 95 short tons of herring was harvested for subsistence use by all five communities (Newtok, Tununak, Toksook Bay, Nightmute, and Mekoryuk). Nelson Island families harvested 154 pounds of herring per capita and Nunivak Island families harvested 38 pounds herring per capita. This was the second lowest documented harvest since 1986, but was a considerable improvement in both quantity and quality over 1991 when 74 tons were caught and many herring were very fat, difficult to dry and spoiled. Unlike 1991, weather-induced spoilage of processed herring was not reported or documented. Participation rates by households and fishing families increased over those in 1991.

In 1992, Nelson Island families were selective of fishing times and herring runs in order to improve quality of their catch. "Fatty" herring with high oil content were processed using more labor-intensive methods to optimize drying success. Weather conditions were very suitable for drying. Subsistence herring fishing by Nunivak Island families was hampered by persistent sea ice. More families in Mekoryuk attempt to collect herring spawn-on-kelp for subsistence; however, none was collected in 1992 because herring did not spawn along the ice-lined north shore.

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## ACKNOWLEDGEMENTS

Many people contributed to this report through their work in previous field seasons and on previous reports and by reviewing past results, and to all of them I offer my thanks. Most of all, I am grateful to the people of Nelson Island and Nunivak Island, especially the community officials, for their continued cooperation and willingness to participate in this project. Tom Noatak, Kimberly Hooper, and Agatha John were diligent and efficient field assistants in 1992. Janet and Seymour Hendrickson, Mike, Susie and Anna Angaiak, Kathy and Charles Moses, and Theresa and Vincent Waska were hospitable and generous hosts, as usual. Many other families fed me, took me in their boats, and invited me to their steambaths, and I thank them. Elizabeth Andrews, Bob Wolfe, and Charles Utermohle with the Division of Subsistence, and Charles Burkey with the Division of Commercial Fisheries reviewed and edited various drafts of this report. Vicky Leffingwell helped with the administrative tasks of this project through its many seasons and James Marcotte redrafted the map for this report.



## INTRODUCTION

This report describes results of subsistence herring harvest surveys conducted in summer 1992 in the Nelson Island area communities of Newtok, Tununak, Toksook Bay, and Nightmute, and in Mekoryuk on Nunivak Island (Fig. 1). This was the sixth survey in the Nelson Island communities conducted by the Division of Subsistence since 1986 and the third consecutive annual survey in Mekoryuk. Findings from 1992 are compared with 1986-88 and 1990-91 survey results.

Since the 1960s, the quality and quantity of Nelson Island and Nunivak Island herring stocks have fluctuated extensively with significant impacts to subsistence herring harvests and the local subsistence economy (Hemming, Harrison, and Braund 1978; Lenz 1980; Pete 1984; Pete 1991a, 1991b, 1991c). Herring declines in the 1960s and 1970s attributed to offshore overfishing by foreign vessels left area residents wary of commercialization of local herring stocks in the early 1980s (Pete 1984). With a strict management regime to protect local stocks and subsistence uses, commercialization began in 1985. In 1986-88 detailed surveys were conducted at the request of Nelson Island residents to document their subsistence herring harvests and uses. Through these surveys we learned that communities in the Nelson Island region of western Alaska have a long-established and specialized dependence on herring. They have produced the highest total and per capita harvests of herring for subsistence use in the state (Pete and Kreher 1986; Pete, Albrecht, and Kreher 1987; Pete 1991a, 1991b).

The commercial herring sac-roe fishery developed into an important local source of monetary income where few opportunities to generate income exist. Projected herring returns to both Nelson Island and Nunivak Island districts have been below allowable commercial harvest thresholds since 1990 and compelled resumption of detailed subsistence herring harvest surveys in 1990 (Hamner 1989;

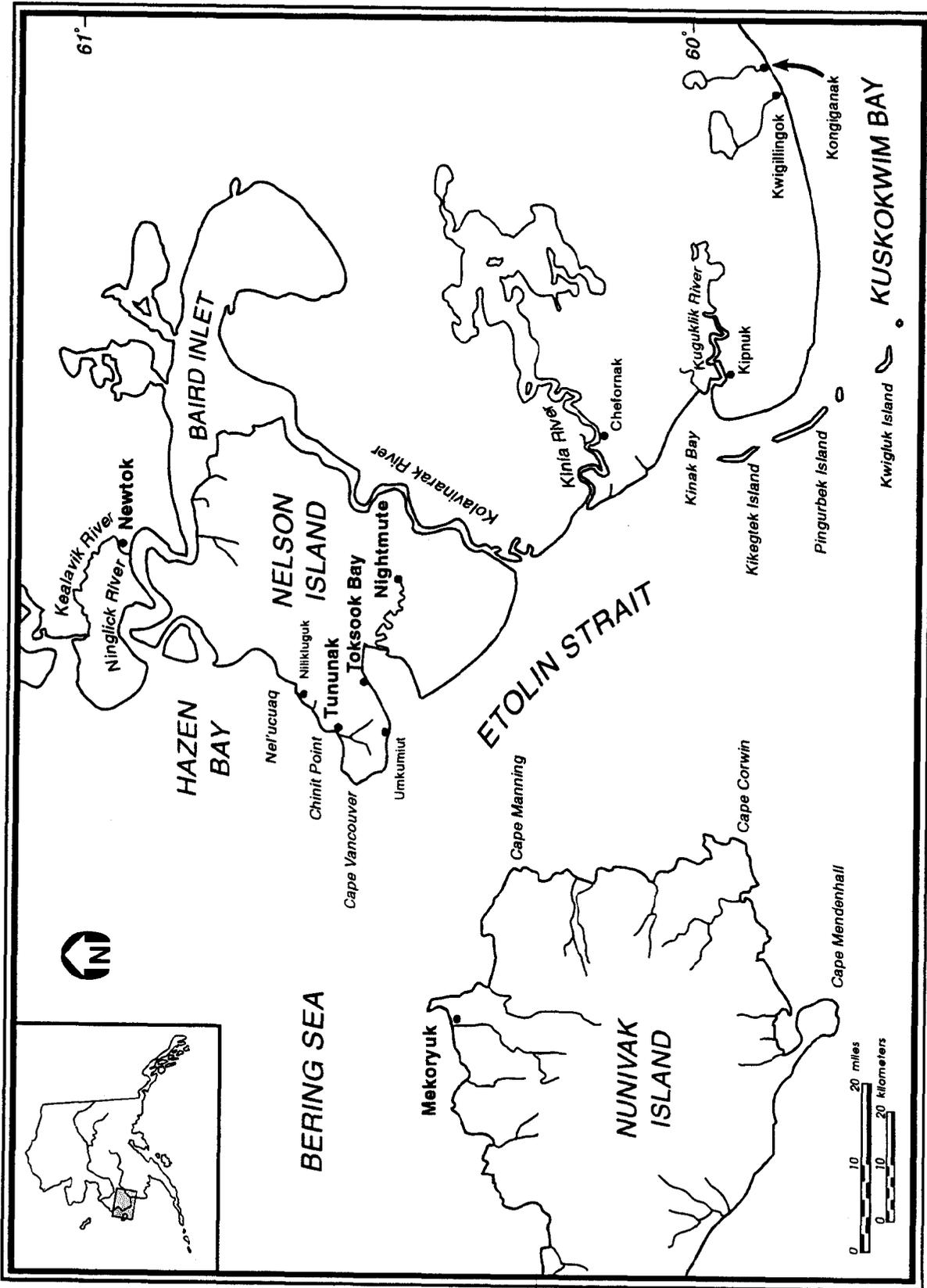


Fig. 1. Location of communities on Nelson and Nunivak islands.

Alaska Department of Fish and Game 1990, 1991; Pete 1991a, 1991b, 1991c). Nelson Island herring returns were slightly above the threshold to allow commercial fishing in 1990, but no buyers registered for the district in anticipation of the low returns. In 1990, observed herring numbers in the Nunivak Island district were approximately one-third of the amount needed to allow a commercial harvest. Herring returns in 1991 were the inverse of those observed in 1990; commercial quantities returned to the Nunivak Island district, but not the Nelson Island district (Alaska Department of Fish and Game 1992a; Burkey and Hamner 1992). In 1992, herring returns were substantial enough in both districts to allow small commercial harvests and some improvement in the quantity and quality of the subsistence fishery at Nelson Island (Alaska Department of Fish and Game 1992b).

Nelson Island respondents compared herring fluctuations throughout the past several decades and noted some parallels between declines which began in the 1960s and those in the 1990s (Pete 1991b; 1991c). Similarities included increased abundance of "fatty" herring with high oil content in the diminished returns, especially early in the season; shorter duration of herring runs; and localization and concentration of spawning schools along Cape Vancouver. Subsistence fishing families avoid large catches of fatty herring because they require specialized processing (see below). Elders observed a few differences in recent herring declines; some were more disturbed than they had been with declines in the late 1960s. In earlier shortages, herring in subsistence catches were uniformly large one year, and then decreased in size the next year, suggesting selective overharvest of portions of the herring runs by offshore foreign fisheries. In the 1990s, mixed sizes and high oil content of herring throughout the seasons were a sign to local residents that recent declines may be more drastic. Different-sized herring (age classes) were mixing, perhaps because the season's entire return was too small to sustain adequate, normal spawning saturation as discrete age classes. As few as one-fifth of

peak biomass observations of the mid 1980s were returning in the early 1990s (Burkey and Hamner 1991, 1992). Plus, fewer herring competing for abundant food have may have resulted in a greater proportions of fatty herring in the returns. Elders stated that local stocks may not have recovered fully from declines in the 1960s prior to local commercial fisheries development. Some added that the herring may face a more difficult recovery because of harvests by distant food and bait and offshore trawl by-catch fisheries.

Local concerns of distressed herring stocks generally are consistent with observations by state managers. Due to weak recruitment levels throughout the 1980s, the 1977-78 year classes have carried these fisheries since 1982 (Burkey and Hamner 1991, 1992). In recent years, the biomass of these cohorts has decreased dramatically because of increased mortality. The combination of weak recruitment and increasing mortality of the strong year classes is believed to be the major factor in the recent declines of Nelson and Nunivak islands herring stocks (Ibid). Causes of weak recruitment are not fully understood, but probably involve many factors, including environmental and weather conditions such as presence and persistence of sea ice during spawning, wind direction and water currents during larval development, and abundance of predator species (Grosse and Hay 1988).

In difficult years, subsistence fishing families made adjustments to cope with reduced herring numbers and quality problems. The 1992 subsistence fishing season was better than the previous two and offered cause for reserved optimism by subsistence fishing families. In 1992, managers observed the first significant recruitment to the fisheries since 1977-78 year classes (Alaska Department of Fish and Game 1992b). Along with slight increases in herring numbers, much of the improvement in subsistence herring production was credited to targeting of leaner herring, optimal weather conditions for drying herring, and innovative processing methods of the subsistence catch, as described below.

## METHODOLOGY

Surveys were administered with the same method used in previous years (Pete and Kreher 1986; Pete, *et al.* 1987; Pete 1991a, 1991b, 1991c). Letters to community officials were sent in early June requesting permission to administer surveys and recommendations for local assistants. All communities agreed to participate. Key respondents were contacted by telephone to schedule surveys when fishing had essentially ceased and processed herring were hung on drying racks. This year subsistence herring fishing by a few families in most communities continued after the scheduled surveys until early July. Local assistants reported by telephone the completed harvests for families who fished later. Household censuses were updated with community officials or local assistants upon arrival and used to note participation in subsistence herring production by every household and most individuals. Harvest estimates were generated from direct observation of all herring on drying racks. Comparisons among fishing seasons and information on herring fishing sites and times, spawn-on-kelp harvest levels, and gear used was collected from key respondents in each community.

## COMMUNITY CHARACTERISTICS, 1992

Detailed descriptions of the survey communities were included in previous reports (Pete and Kreher 1986; Pete *et al.* 1987; Pete 1991b). To summarize, each island is occupied by its own Yup'ik society; traditionally there were approximately 20 distinct societies in the Yukon-Kuskokwim Delta region. The Nelson Island society is known as *Qaluyaarmiut* (from *Qaluyaat*, the place name for Nelson Island proper), and the Nunivak Island society is *Nunivaarmiut* (from *Nunivaaq*, also the place name for Nunivak Island). Historically, each society was bound by kinship

ties; members generally married within the group, spoke a distinctive dialect, and had specialized and essentially self-sustained use patterns of a specific area (Lantis 1946; Fienup-Riordan 1983; Shinkwin and Pete 1984; Andrews 1989). In these communities, many traditional social processes and cultural beliefs still function to guide relations and behavior. The *Qaluyaarmiut*, especially, are relatively traditional in many ways; most children still speak Yup'ik Eskimo as their primary language and many middle- and older-aged people effectively speak only the Yup'ik Eskimo language.

Similar to previous years, most residents (97 percent) of both islands were Yup'ik or Cup'ik (Nunivak Island dialect of Yup'ik) Eskimo and the entire region experienced a slight increase in population. In 1992 the Nelson Island population increased by four percent and the number of households increased by three percent over the previous year for a total of 1,188 persons in 219 households (Table 1) (Pete 1991c). As in 1991, intervillage migration occurred among all Nelson Island communities due to marriage or jobs, as well as some, but less, movement for jobs between the communities and Bethel, the regional service, trade, and transportation center, approximately 130 miles east of Nelson Island. Newtok experienced the largest immigration. Four households including 23 people from Tununak moved to Newtok; all couples had grown up in the Newtok area and were "moving back." Two couples charged recent herring declines as a factor in their decision to move back to Newtok. They stated that from Newtok, they would have easier access to freshwater fish species, such as Northern pike and whitefish, to supplement herring as their main winter food. Toksook Bay's increase of 34 people was attributable to natural growth, long-term foster children assignments to foster parents in that community, and immigration from Nightmute. Two Mekoryuk households moved to Bethel and several moved back to Mekoryuk, resulting in the same number of households as in 1991, but a slight decrease in the population from 204 to 187 people (Table 1) (Pete

1991c). Like 1991, average household sizes were typically large in Nelson Island communities, ranging between 4.8 to 7.0 persons per household, in contrast to smaller households in Mekoryuk (3.0 persons) (Table 1).

TABLE 1. NELSON ISLAND AND NUNIVAK ISLAND POPULATION AND HOUSEHOLD PARTICIPATION IN SUBSISTENCE HERRING PRODUCTION, 1992

Community	Population	Total number of households	Average household size	Number of participating households	Number of fishing families
<i>Nelson Island</i>					
Newtok	235	45	5.2	22 (49%)	14
Tununak	309	65	4.8	53 (82%)	34
Toksook Bay	483	86	5.6	64 (74%)	36
Nightmute	160	23	7.0	17 (74%)	13
Subtotals	1,188	219	5.4	156 (71%)	97
<i>Nunivak Island</i>					
Mekoryuk	187	62	3.0	30 (48%)	17
Totals	1,375	281	4.9	186 (66%)	114

The communities continue to rely on local wild resources, the most stable sector of the economy in many rural communities (Wolfe and Walker 1987). Over 90 local species of fish, game, and plants were harvested and used for subsistence by residents of these communities (Pete 1991a). Seasonal employment, commercial fishing, and cottage industries provided the major opportunities for monetary income; permanent year-round jobs were few. Cost of living is high, in part, due to

the expense of importing goods and services. Reductions in or lack of a local commercial herring sac-roe fishery in recent years were expressed as a loss of an important source of income in all communities. In particular, many respondents in Mekoryuk complained about time and gear conflicts with the commercial herring fishery along the east shore of Nunivak Island. Boats, nets, and personnel were committed to the marginally successful commercial sac-roe fishery and away from the subsistence fishery in 1991 and 1992.

## SUBSISTENCE HERRING FISHING, 1992

### Nelson Island District

Patterns of harvest and production of herring for subsistence use by area residents have been described in detail; gear used, areas fished and processing methods have remained similar to those reported earlier (Pete and Kreher 1986; Pete *et al.* 1987; Pete 1991a, 1991b). Briefly, boats used were locally made wooden or imported aluminum skiffs 14 to 28 feet in length; gill nets with 2 to 2-3/4 inch mesh and 60 to 300 feet long were set; and areas fished were customarily productive sites located near communities. Fishing and processing activities were organized and managed usually by a married couple in charge of an extended-family cooperative work group or production unit involving members of more than one household and many individuals with a wide age range. Generally, men oversaw and engaged in fishing and women took charge of processing and storage.

In Tununak, gill nets were usually set as soon as the adjacent shoreline was ice free and herring were present in appreciable numbers in traditionally used fishing areas, a time span from mid May to early June. At Newtok and Nightmute, fishermen and women waited until rivers were clear of ice, while at Toksook Bay

people waited until subsequent runs of herring, noted for lower oil content, arrived. Thus, subsistence fishing for herring generally occurred from mid May through mid June around Nelson Island.

The 1990 and 1991 subsistence herring seasons were unusual, in part, because there were higher than usual catches of "fatty" herring, those with very high oil content. In 1990 herring were relatively plentiful early in the season and then decreased dramatically in mid June. Herring were consistently few throughout the 1991 season especially along the north shore of Nelson Island resulting in more labor-intensive harvesting activities. It was a very difficult season in 1991 for Tununak and Newtok fishing families, who fished longer than usual for a catch that yielded the lowest recorded harvests (Pete 1991c). Further, some families in all communities ran out of dried herring in late winter, with the majority of families eating up their stores by April, which is unusually early. A few shared small supplies of fermented, partially-dried, oily herring; generally only elders eat this product. Many people said they "craved herring."

Although herring were still not as abundant in 1992 as they had been in the mid 1980s, the season was considered a favorable contrast to the poor 1991 season. Sea ice persisted through the first week of June, delaying fishing activities. Herring were relatively plentiful throughout the entire season, but families were determined to avoid quality problems common in 1990 and 1991 caused by large catches of fatty herring. Subsistence fishing activities started earliest in Tununak (June 7), continued for nearly one week followed by a four-day break, and resumed on June 17 for another week. Tununak families tested their catches for oil content and many ceased fishing by June 12 because fatty herring were prevalent. The second wave of fishing occurred with the second run of herring when catches of fatty herring decreased. Once herring catches in Tununak included more lean herring, fishing in all communities commenced in earnest through all of June. In 1992, subsistence

fishing in all communities except Newtok occurred intermittently until July 5, about two weeks later than usual. This is the first time surveyors observed community-wide selective "pulse" fishing by Tununak families to avoid fatty herring, patterns witnessed primarily in Toksook Bay and Umkumiut, the fish camp used by Toksook Bay and Nightmute families. Respondents in Tununak were fairly confident that later runs with less fat would appear because of the large early showing and reports from Chefornak that herring were moving from the south toward Nelson Island.

Each year subsistence processors note the oil content of herring as fatty herring is susceptible to weather-induced spoilage. This is particularly problematic in late June and early July when generally sunny and windless weather is interspersed with drizzling rain. Fatty herring requires more labor-intensive processing to dry properly. In 1991, the survey was administered later than previous years enabling the surveyor to observe and note spoilage rates. That year's study found that 40 to 60 percent of the Toksook Bay processed catch had to be thrown out and large percentages (up to 90 percent in one case) of some Newtok families' processed catches were unsuitable as human food (Pete 1991c). These proportions of fatty herring in the catch and rates of spoilage are uncharacteristically high.

The 1992 survey was administered at the same time as the 1991 survey with intentions to observe spoilage rates. Fortunately, due to the increased abundance and quality of herring and concerted efforts to harvest leaner herring, the proportion of fatty herring in the subsistence catch was much less than it had been in 1991. Although the 1992 ratio of fatty to lean herring in the catch remained higher than the averages in the mid 1980s (Pete 1991c), no spoiled herring were observed or reported in 1992 because of innovative and more specialized processing of fatty herring, and better drying weather throughout the season. In addition to braiding fatty herring as *ullipengayiit* (plural; *ullipengayaq*, singular; means "those that are filleted and exposed to the air"), large numbers of fatty herring were cut and hung

like individual salmon (*cegat*, "fish cut for drying"). Lean herring are gutted and braided into strings immediately (called *tamalkuryat*, "those that are whole"). Fatty herring processed as *cegat* were filleted, ventral and dorsal fins and bellies removed, and hung on drying racks by their tails. Specially made drying racks of 1x4 milled lumber or long, thin pieces of driftwood were constructed to hang *cegat*. When partially dried, these herring were individually transferred to the smokehouse and smoked to prevent the oil-infused flesh from turning rancid. Racks in smokehouses also had to be made to accommodate *cegat*. This innovation, begun in 1991 by one family in Toksook Bay, was adopted by many families throughout the area because more of the fatty herring processed in this manner dried more thoroughly. The family shared samples of the dried and smoked herring with many area residents through community feasts or offered them to families who had run out of herring in late winter. The dried and smoked product continued to taste good and palatable throughout the winter, although it was distinctively different from traditionally produced *ullipengayiit*. This alternative drying process was extremely labor intensive, but was considered to be worth the added effort to preserve their main winter food, which is herring.

The ratio of *ullipengayiit* to lean herring indicates the prevalence of fatty herring in the subsistence catch and in turn shows the proportion of the catch that is subject to spoilage if suitable weather does not prevail. In 1992, the proportion of strings of herring processed as *ullipengayiit* and *cegat* combined was between rates documented in the mid 1980s and the high rates in 1990 and 1991 (Table 2). In the 1992 season, nearly 23 percent of all strings of herring were processed as *ullipengayiit* or *cegat* on Nelson Island, compared to regional averages between 11 and 20 percent of all strings in 1986-88, 25 percent in 1990 and a high of nearly 36 percent in 1991 (Table 2) (Pete 1991c). A relatively large percentage of Newtok's 1992 catch (30.3 percent) was processed as *ullipengayiit* reflecting their fishing

TABLE 2. TOTAL STRINGS OF HERRING PRODUCED FOR SUBSISTENCE USE AND PERCENTAGE OF TOTAL STRINGS PROCESSED AS ULLIPENGAYIIT BY NELSON ISLAND COMMUNITIES, 1986-88 AND 1990-92<sup>a</sup>

Community	1986		1987		1988		1990		1991		1992	
	Total no. of strings	Percent ullipe- ngayiit										
Newtok	503	7.2%	463	8.3%	618	18.3%	351	16.2%	42	45.4%	312	30.3%
Tununak	2,615	17.2	2,331	17.4	2,537	27.2	2,441	28.0	1,121	48.4	1,561	27.3
Toksook Bay	2,779	7.2	2,348	9.4	2,998	14.6	2,040	23.0	2,000	29.6	2,034	18.8
Nightmute	1,032	7.2	758	4.4	906	16.9	no data		371	29.2	480	19.0
Totals	6,929	11.0	5,900	12.0	7,059	19.7	4,832	25.0	3,536	35.7	4,387	22.7

<sup>a</sup>Total numbers of strings vary slightly for some communities from previous reports (Pete and Kreher 1986; Pete *et al.* 1987; Pete 1991b). The numbers reported here are the final adjusted figures and percentages.

exclusively early in the season (Table 2). Most families were relieved and pleased with the higher catches of leaner herring compared to the 1991 season and the good drying weather in 1992; they declared the 1992 season a qualified success.

Household involvement in subsistence herring production increased from a low of 63 percent in 1991 to 71 percent in 1992, which more closely resembles participation rates of the 1980s (Table 3) (Pete 1991c). The few households and families who did not resume subsistence production activities included those who moved to Newtok and were not yet geared for subsistence herring harvesting and processing or those who could not fish due to poor health. Some of them cooperated with other families or fished for other species, such as salmon, halibut and pike, that require less coordination in production and are less sensitive to inclement weather during the drying process. In 1992, subsistence fishing for salmon and halibut was relatively early, nearly coinciding with herring fishing, and highly productive compared to 1991. Many families fished for these species in addition to herring and reported that the abundance and productivity of these other species affected their herring fishing activities -- they caught less herring than they had planned. Families were prepared to supplement their herring catches, as they had in 1990-91, and were pleased efforts were so productive. However, respondents still stated that herring is the preferred traditional winter food for Nelson Island families as evidenced by the special efforts to increase the quantity and improve the quality of the catch and the chances for a good dried product.

### Harvest Levels

The total 1992 subsistence herring harvest by Nelson Island communities was an estimated 91.5 short tons (Table 3), about 21 tons higher than the 1991 harvest, but the second lowest recorded total harvest since 1986. The 1992 catch was roughly

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 1990-92

Community	1986		1987		1988		1990		1991		1992	
	Short tons involved	Percent house-holds involved										
<i>Nelson Island</i>												
Newtok	12.6	46%	10.0	56%	12.5	68%	7.9	51%	0.9	31%	6.5	49%
Tununak	63.3	86	48.0	85	49.3	86	54.0	81	20.9	73	32.1	82
Toksook Bay	69.5	83	51.0	83	58.5	84	46.3	73	40.0	69	43.0	74
Nightmute	21.4	64	15.0	65	16.0	74	17.5 <sup>a</sup>	67	8.3	67	9.9	74
Subtotals	166.8	75	124.0	76	136.3	80	125.7	72	70.1	63	91.5	71
<i>Nunivak Island</i>												
Mekoryuk <sup>b</sup>	no data		no data		no data		4.5	59	3.9	48	3.5	48
Totals							130.2	69	74.0	60	95.0	66

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

<sup>b</sup>Herring harvest data from 1986-88 for Mekoryuk were incomplete and have been omitted (Pete 1991b).

50 tons less than the annual average harvests of 142 tons in 1986-88 (Fig. 2) (Pete 1991a, 1991b, 1991c). Per capita pounds of herring produced for subsistence increased from or was equal to 1991 per capita production in each community (Fig. 3). The Toksook Bay harvest increased by three tons, but the per capita harvest stayed the same because of the increase in population. Regional Nelson Island per capita production increased by 31 pounds over 1991 levels to 154 pounds (Fig. 4), but this was exactly one-half of the 1986 per capita harvest, a season considered satisfactory. Regional per capita herring production for subsistence ranged from 227 to 308 pounds in 1986-88 (Fig. 4). Newtok harvest levels reflected the largest increase from 1991 -- 6.5 tons of herring was caught for food in 1992 compared to barely one ton in 1991 (Table 3) (Pete 1991c).

Table 4 shows the annual range of harvest by subsistence herring production units or fishing families in each community. The highest upper ranges of harvest occurred in the 1986 season, the most productive in terms of total harvest. Although there were fluctuations throughout the years in both the lower and upper limits of harvest, the lowest harvest ranges in almost all communities were found in 1991. The lower range of harvest dropped dramatically in Newtok and Tununak in 1991, with the lowest amount totaling six pounds of herring for one Newtok family, barely one meal. Furthermore, average fishing family harvests by community concentrated toward the low end of the range. The lowest catch ranges for Newtok and Tununak increased appreciably in 1992, although it was still quite reduced for Newtok (Table 4). In 1992, the upper range of harvest increased for many families in all communities and average family harvests were within the mid range in all communities except Newtok. In general, the 1992 subsistence herring fishery was a measurable improvement over the 1991 season. When considering no spoilage of the processed catch in any of these communities was reported or documented in 1992, it does indeed compare much more favorably to the previous season.

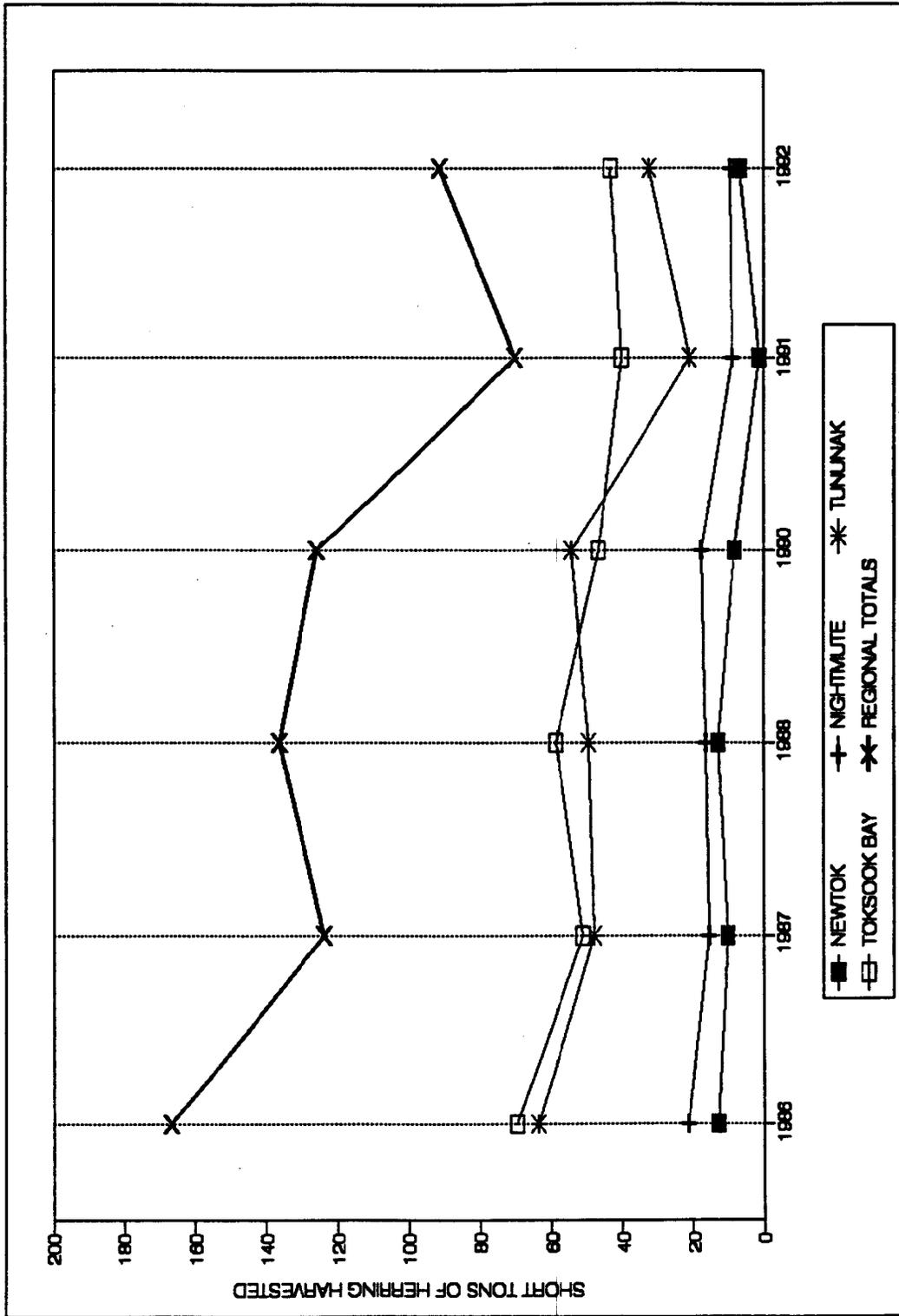


Fig. 2. Short tons of herring harvested for subsistence use by four Nelson Island communities, 1986-88, and 1990-92.

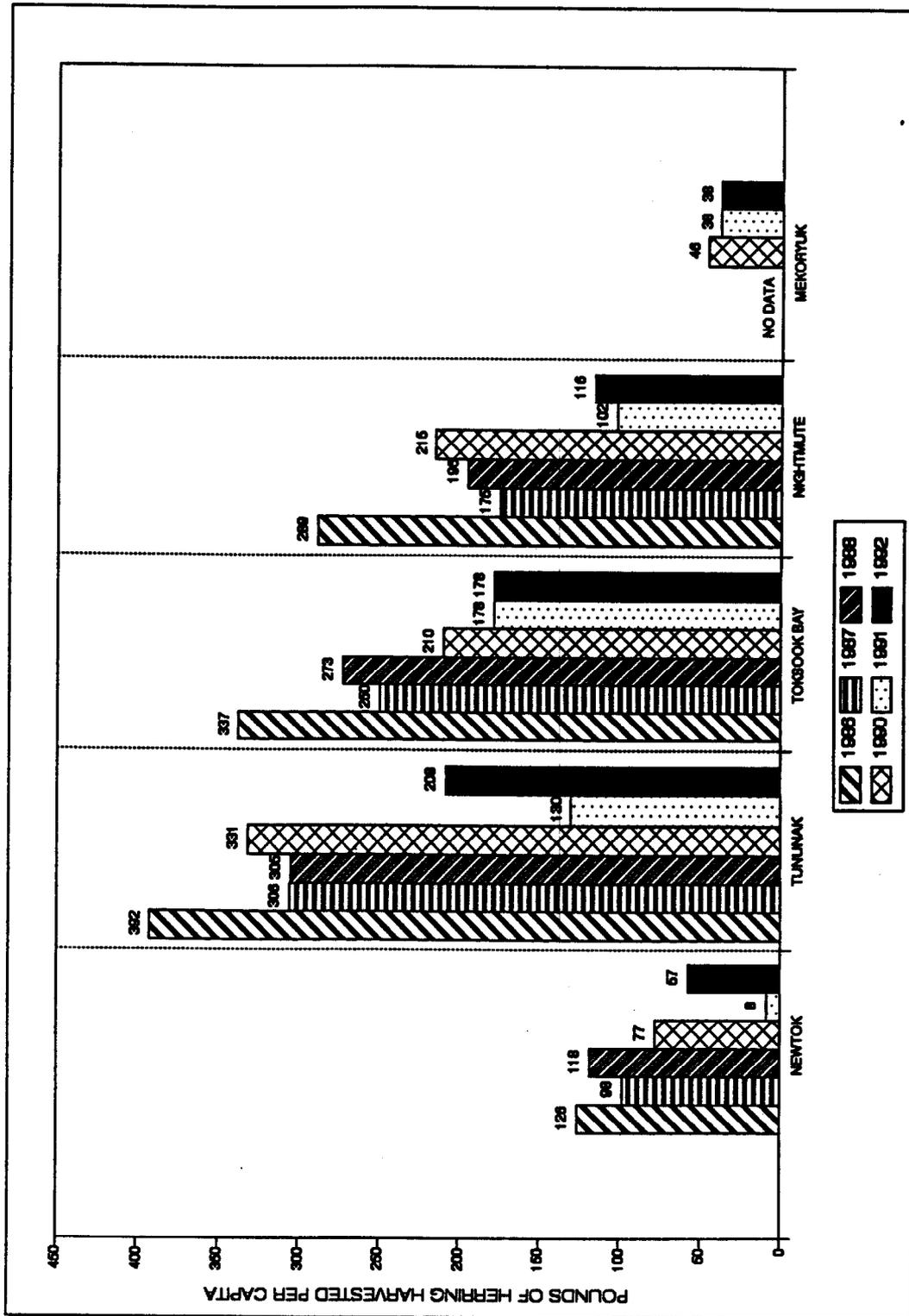


Fig. 3. Pounds of herring harvested per capita for subsistence use by Nelson Island and Nunivak Island communities, 1986-88, and 1990-92.

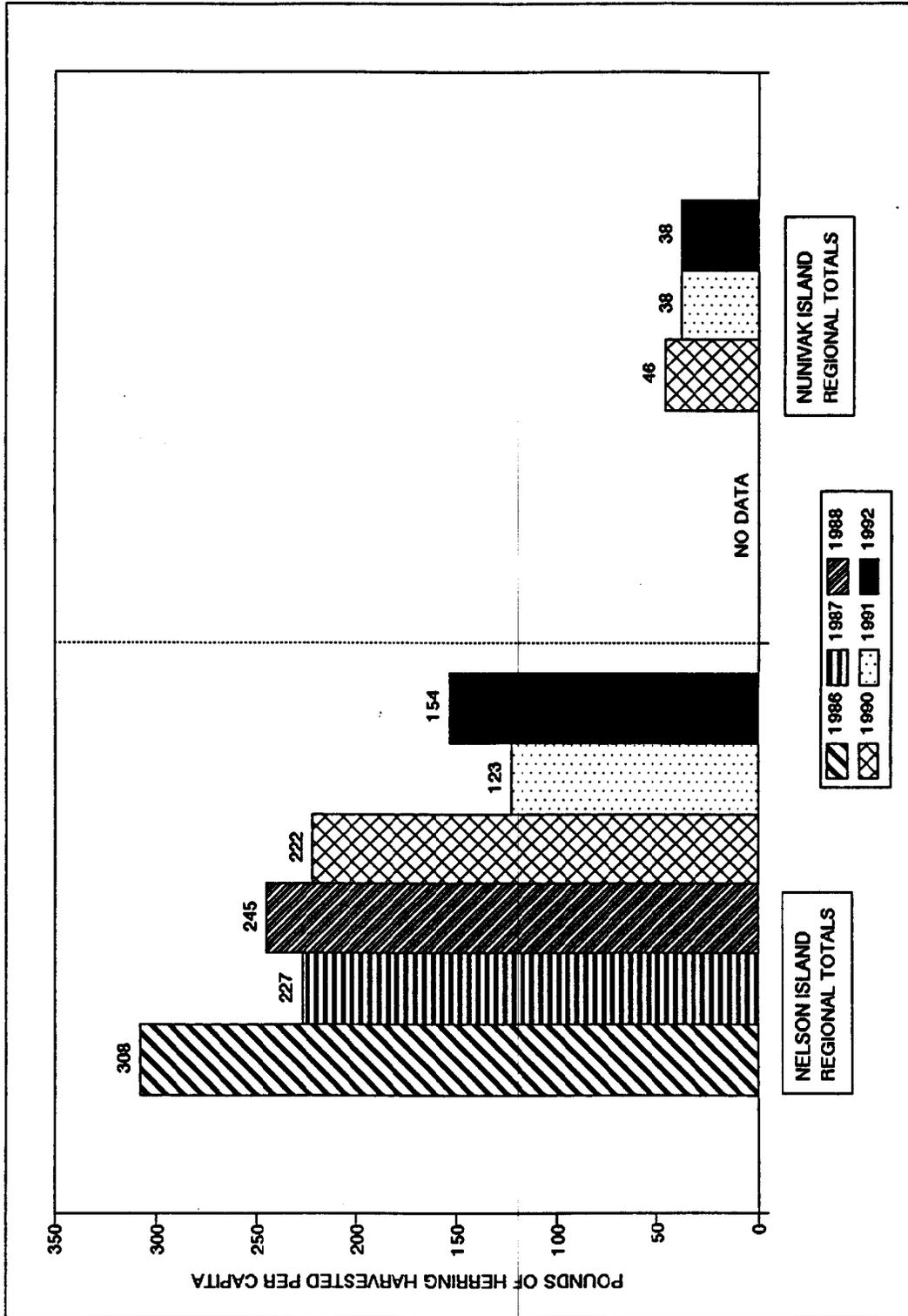


Fig. 4. Regional totals of pounds of herring harvested per capita for subsistence use in the Nelson Island and Nunivak Island districts, 1986-88 and 1990-92.

TABLE 4. RANGE OF HARVEST IN POUNDS OF HERRING FOR SUBSISTENCE USE BY PRODUCTION UNITS IN COMMUNITIES IN THE NELSON AND NUNIVAK ISLANDS DISTRICTS, 1986-88 AND 1990-92

Year	<u>Range of harvest in pounds by subsistence herring production units</u>				
	Newtok	Tununak	Toksook Bay	Nightmute	Mekoryuk
1986	573 - 5,189	1,248 - 6,258	1,381 - 7,236	1,156 - 7,137	no data
1987	651 - 3,450	1,192 - 5,587	644 - 5,516	689 - 3,845	no data
1988	466 - 3,428	507 - 5,404	852 - 6,186	318 - 4,033	no data
1990	265 - 2,390	227 - 5,214	799 - 4,734	626 - 3,998	35 - 900
1991	6 - 582	19 - 2,832	459 - 3,967	480 - 2,746	52 - 700
1992	102 - 1,827	201 - 3,450	502 - 4,962	683 - 4,244	88 - 788

#### Nunivak Island District

Patterns of subsistence herring production by residents of Mekoryuk were described in detail in the 1990 survey report and summarized in the 1991 report (Pete 1991b, 1991c). Timing and processing methods of subsistence herring on Nunivak Island were similar to those reported for Nelson Island with fishing occurring from mid May to mid June. Gill nets were set, seined, or "drifted" for herring with skiffs similar in size to that described for Nelson Island. Other customary and continued 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. Fishing methods were dictated by tides, local environment, and personnel involved. For example, women and children were almost exclusively

involved in hand-picking herring from tidal pools at low tide, whereas lone men operated toss nets, and related adults, both men and women cooperated in drifting and seining for herring.

Set and drift net fishing areas commonly used extended east and south from Mekoryuk to Cape Corwin (Fig. 1). In 1992, sea ice was present along the north and northeast shore well into June, hampering subsistence fishing and preventing spawn-on-kelp collecting activities. Sea ice prevented families from going across Etolin Strait to Nelson Island to fish for herring, as some who had missed the narrow window of opportunity around Nunivak Island had done in 1990 and 1991. Most herring caught for subsistence in 1992 were brought to Mekoryuk from commercial fishing camps along the east shore in mid June. Several families were still fishing in late June in the Mekoryuk River, a reportedly unusual fishing site. A family had set nets for species such as flounder and saffron cod, but noticed herring in their catches and they and other families renewed efforts to get herring by changing to herring nets and seining for herring. The presence of sea ice through most of June is blamed for the unusual occurrence of herring in the Mekoryuk River.

As on Nelson Island, production of herring for subsistence use was a kin-based operation in Mekoryuk, with members of extended families, generally a married couple and their adult children from separate households, working together. Five former Nunivak Island families residing in Bethel returned to the island to produce herring for subsistence, as they had in 1990 and 1991. Only one of the five families was successful at harvesting herring in 1992. Several others were promised portions of the processed catch later in the season.

Although herring has not assumed the same importance, nor is it harvested in the same amounts for subsistence as on Nelson Island, Mekoryuk respondents concurred with their neighbors on Nelson Island that herring numbers had been decreasing since the mid 1980s. Each season, it was reported, there had been a

progressively shorter time span when herring stayed in waters off of Nunivak Island, thereby decreasing the effective fishing time (Pete 1991b). The persistence of sea ice late into the fishing season in 1992 exacerbated this trend. As mentioned earlier, no herring spawn on kelp was collected in 1992. Once sea ice abated in late June, a few families checked the west end of the island for herring spawn-on-kelp, but much of it had matured beyond use for subsistence. These fluctuations in local herring stocks have made herring a less reliable food resource for Mekoryuk families than has been the case in previous years.

### Harvest Levels

In 1992, 17 Mekoryuk fishing families comprised of 30 households produced 3.5 short tons of herring for subsistence use (Table 3). Effort was similar to 1991, which was less than in 1990; 48 percent of Mekoryuk households were involved in subsistence-herring production in 1992 and 1991 compared to 59 percent in 1990 (Table 3). Per capita pounds produced was the same as 1991 -- an estimated 38 pounds compared to 46 pounds in 1990 (Fig. 3). In 1992, fishing family harvests ranged from 88 to 788 pounds (Table 4) for an average of 416 pounds of herring per fishing family. Although there was limited effort to collect herring spawn on kelp, none was collected for subsistence in 1992; approximately 3,400 pounds had been collected in 1991 (Pete 1991c).

Approximately 400 pounds of processed herring were destined for 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. One Bethel-based family fished and processed herring in Mekoryuk, whereas about five Bethel families usually returned to get herring and spawn-on-kelp. Thus, approximately 3.3 short tons were harvested for Mekoryuk families in 1992.

## SUMMARY

All previous surveys since 1986 have demonstrated the significance of herring harvests in the economy of Nelson Island and Nunivak Island communities (Pete and Kreher 1986; Pete *et al.* 1987; Pete 1991b, 1991c). Recent declining returns of herring to the area have affected subsistence harvests, with the 1991 season reflecting the most drastic reductions in harvest levels since 1986 -- only 70.1 short tons were caught in the Nelson Island district compared to 166.8 tons in 1986. In many ways, the 1991 season was a disaster for subsistence herring fishing families in Nelson Island. In 1991, harvests were the lowest on record and the catch consisted of many fatty herring which were difficult to dry. Furthermore, poor drying weather resulted in high spoilage rates of the processed catch in 1991. Many families ran out of dried herring relatively early in the annual subsistence cycle.

The 1992 season provided a moderate, but very welcome increase in harvest levels. Approximately 91.5 short tons were harvested in the Nelson Island district in 1992 with household and fishing family participation rates up from 1991 and approaching levels documented in the 1980s. This was the second lowest harvest documented since 1986, but it was a considerable improvement over 1991 in several ways. Families monitored their harvests and adjusted fishing times to catch less fatty herring; they initiated and used processing methods designed to improve the dried product made from oily herring; and lastly, weather conditions cooperated so that no spoiled herring were reported or documented on Nelson Island. In 1992, supplementary efforts to harvest halibut and salmon were very productive compared to 1991, which made it an even more favorable fishing season.

The 1992 survey was the third complete subsistence herring harvest survey of Mekoryuk households. Subsistence herring fishing was less favorable than it had been in 1991 due primarily to the presence of sea ice until late June along the north

shore of Nunivak Island. Spawn-on-kelp harvests did not occur at all in 1991 because herring did not spawn along the ice-lined north shore and the ice prevented families from crossing Etolin Strait to Nelson Island to fish for herring, as some had done in 1990 and 1991. This was the lowest subsistence herring harvest recorded since the survey began in 1990 -- 3.5 short tons were harvested in 1992 compared to 4.5 in 1990 and 3.9 in 1991 (Table 3), although the 1992 household participation rate (48 percent) was the same as 1991.

Nelson Island and Nunivak Island residents hope that herring returns continue to improve in the coming years, so subsistence uses can return to the quality and levels of the mid 1980s. In 1992, fishery managers observed the first significant recruitment of herring into these fisheries since the 1977-78 year classes. The 1992 season certainly offered some optimism for subsistence fishing families.

## REFERENCES

- Alaska Department of Fish and Game  
1990 Preliminary Summary of the 1990 Pacific Herring Fisheries in the Kuskokwim Bay Area. Alaska Department of Fish and Game, Division of Commercial Fisheries, Bethel.
- \_\_\_\_\_ 1991 Pacific Herring Stocks in the Eastern Bering Sea. Report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Bethel.
- \_\_\_\_\_ 1992a Informational letter to fishermen, processors and interested persons, re: 1992 Nelson Island and Nunivak Island Districts Herring Fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Bethel.
- \_\_\_\_\_ 1992b Preliminary Summary of the 1992 Pacific Herring Fisheries in the Kuskokwim Bay Area. Alaska Department of Fish and Game, Division of Commercial Fisheries, Bethel.
- Andrews, Elizabeth F.  
1989 *The Akulmiut: Territorial Dimensions of a Yup'ik Eskimo Society*. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Technical Paper Number 177.
- Burkey, Charles and Helen Hamner  
1991 Arctic-Yukon-Kuskokwim Region *in* Preliminary Forecasts of Catch and Stock Abundance for 1991 Alaska Herring Fisheries. Fritz Funk, ed. Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau, Regional Information Report No. 5J91-03.
- \_\_\_\_\_ 1992 Arctic-Yukon-Kuskokwim Region *in* Preliminary Forecasts of Catch and Stock Abundance for 199 Alaska Herring Fisheries. Fritz Funk and Marwood Harris, eds. Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau, Regional Information Report No. 5J92-04
- Fienup-Riordan, Ann  
1983 *The Nelson Island Eskimo: Social Structure and Ritual Distribution*. Alaska Pacific University Press, Anchorage.
- Grosse, Daniel J. and Douglas E. Hay  
1988 Pacific Herring, *Clupea harengus pallasii*, *in* Species Synopses: Life Histories of Selected Fish and Shellfish of the Northeast Pacific and Bering Sea. Norman J. Wilimovsky, Lewis S. Incze, and S.J. Westrheim, eds. Washington Sea Grant Program and Fisheries Research Institute, University of Washington, Seattle.
- Hamner, Helen  
1989 Pacific Herring Stocks and Fisheries in the Arctic-Yukon-Kuskokwim Region of the Northeastern Bering Sea, Alaska, 1989. Report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.

- Hemming, James E., Gordon S. Harrison, and Stephen R. Braund  
 1978 The Social and Economic Impacts of a Commercial Herring Fishery on the Coastal Villages of the Arctic/Yukon/Kuskokwim Area. North Pacific Fisheries Management Council. Dames and Moore, Anchorage.
- Lantis, Margaret  
 1946 The Social Culture of the Nunivak Eskimo. Transactions of the American Philosophical Society 35(3):152-323.
- Lenz, Mary  
 1980 You Don't Forget Hunger: In Support of Subsistence Harvest of Herring In Nelson Island, Western Alaska. Nunam Kitlutsisti, Bethel.
- Pete, Mary C.  
 1984 Subsistence Use of Herring in the Nelson Island Region. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Technical Paper Number 113.
- \_\_\_\_\_ 1991a Subsistence Herring Fishing in the Eastern Bering Sea Region: Nelson Island, Nunivak Island, and Kuskokwim Bay. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Technical Paper Number 192.
- \_\_\_\_\_ 1991b Subsistence Herring Fishing in the Nelson Island and Nunivak Island Districts, 1990. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Technical Paper No. 196.
- \_\_\_\_\_ 1991c Subsistence Herring Fishing in the Nelson Island and Nunivak Island Districts, 1991. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Technical Paper No. 211.
- Pete, Mary C., Daniel E. Albrecht, and Ronald E. Kreher.  
 1987 Subsistence Herring Fishing in the Nelson Island District and Northern Kuskokwim Bay. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Technical Paper Number 160.
- Pete, Mary C., and Ronald E. Kreher  
 1986 Subsistence Herring Fishing in the Nelson Island District: 1986. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Technical Paper Number 144.
- Shinkwin, Anne, and Mary Pete  
 1984 Yup'ik Eskimo Societies: A Case Study. Etudes/Inuit/Studies 8 (Supplementary Issue):95-112.
- Wolfe, Robert J., and Robert J. Walker  
 1987 Subsistence Economies in Alaska: Productivity, Geography, and Development Impacts. Arctic Anthropology, 24(2):56-81.