group, most commonly composed of primary kin (parents, children, grandchildren, and siblings), who cooperate to harvest and process herring for their winter food. In general, relationship of harvesters and processors to managers is that of son or son-in-law and daughter or daughter-in-law to parents or parents-in-law. Each unit has "managers" who direct activities of the group, provide equipment, and maintain facilities needed for the production of herring for subsistence use for that group.

Tununak

The herring drying racks in Tununak are the most prominent feature of the community's waterfront. A total of 110 racks constructed of logs up to 12 inches in diameter line the waterfront. The typical construction is two upright posts from 3 1/2 to 10 feet high; some of the longer (30 or more feet) racks have a middle third upright post. Another log, from 6 to 46 feet long, spans the distance between the uprights. The crosspieces are carefully smoothed so the braided strings of herring do not snag when they are turned during the drying process. In Tununak, a large rack may hold as many as 67 strings of herring, with as many as 88 fish per string. Based on the average commercial herring weight of .69 pounds per fish, a large rack may hold 4,000 pounds of herring. Once built, racks like those in Tununak, should last approximately 20 years before maintenance is required. Some racks have been used for several generations. Although seldom needed, maintenance can be time-consuming and the effort to locate enough large drift logs to replace rotten members can be considerable. The very size of the rack requires
cooperative effort when major repairs or new constructions are needed. At least one family constructed new racks in Tununak during the research period. This signalled the beginning of a new production unit. In Tununak, "teepee-style" racks are viewed as temporary structures, to be constructed when needed. None were used in Tununak in 1986.

In Tununak, 86 percent of all households were involved in one of the 37 production units (Table 6). There were one to six households per production unit, including households from outside Tununak, and between two to nine persons per production unit including "managers," fishermen, and processors. The 37 Tununak production units included 91 fishermen and 96 processors, so that each production unit had an average of 2.4 fishermen and 2.6 processors.

The average age of heads of households with "rack managing couples" was 53 years with a range of 33 to 81 years. Seventy percent were between 40 and 69 years of age. Eight percent of the heads of households with "rack managers" were female; most were widows.

There were 34 nets set or used for drifting among the 37 production units. Two production units shared one net and three shared another; Managers of the production units that shared nets were all siblings. The 37 production units own 110 racks of which 83 percent were used to dry herring during the 1986 season. They owned between two to five racks per unit.

Some Tununak production units included members of one and two other communities in addition to Tununak. Of the approximately 160 people with active roles in production, 19 were from communities other than Tununak but all were relatives of Tununak residents (Table 6). These
family members now reside in Newtok, Toksook Bay, Chevak, Bethel, Akiachak, Anchorage, and Juneau.

Of the 160 people involved in production, 52 percent were female (Table 6). Eighty-eight individuals (55 percent; five were males) participated in processing activities and 75 people (46 percent; all but one were males) were harvesters (Table 6). Ten fishermen helped harvest for more than one production unit, whereas three processors worked in more than one. In all, approximately 44 percent of the population of Tununak (141 of 323 people) was actively involved in the production of herring for subsistence use. Their ages ranged from 11 to 77 years.

Newtok

In contrast to Tununak, Newtok herring drying racks are not highly visible. In most cases they are closely associated with dwellings and other racks. Drying racks in Newtok are not used exclusively for drying herring. Pike and salmon, as well as other species of both fish and game are dried on the racks. In Tununak and Toksook Bay, herring harvests are so large that there is little room left for drying salmon or other fish on the large log racks, so smaller racks are usually constructed for drying other wild food. The racks in Newtok range between 11 and 28 feet in length and are between 5 and 7 feet high. Generally they are of lighter construction than racks in Tununak. A few are made from logs 8 to 10 inches in diameter, but many are made from smaller poles only a few inches in diameter. The largest rack held 28 strings of herring, over
1,600 pounds of fish.

Forty-six percent of Newtok households participated on one of 15 production units with an average of 1.2 households per unit (Table 6). As many as three households were involved in a production unit. Between three and eight individuals provided service as "managers," fishermen, or processors in each production unit. There were a total of 32 fishermen and 34 processors for an average of 2.3 fishermen and 2.4 processors per production unit (Table 6).

Heads of households with rack managers, all but one being male, have an average age of 50 years with a range of 30 to 64 years. Most (64 percent) were between 40 and 59 years of age.

All thirty drying racks not used for other fish or game had strings of herring on them. There were between one to four racks per production unit. Twelve gill nets were used among the 15 production units. Four production units shared nets and harvesters, but not processors.

In Newtok, 24 percent of the population (n=199) participated in herring harvesting and processing (Table 6). These individuals ranged in age from 11 to 64 years. Most people restricted their effort to a single production unit, but at least three harvesters and one processor worked with two or more production units.

Only four of the 56 individuals active in harvesting and processing herring were from communities other than Newtok. The communities were Chevak, Hooper Bay, and Anchorage. Of the 56 participants, 41 percent helped only with harvesting, 50 percent only with processing, and approximately 9 percent (all females) both harvested and processed herring.
Toksook Bay

Herring drying racks in Toksook Bay are concentrated in three major areas (Fig. 6). South of the town proper are racks that belong to six families. These racks are approximately 300 yards from the closest dwelling. A second group of racks follows along the edge of a small bluff that dominates one half of the town's waterfront. A third major group of racks line the west bank of the small river that borders the town on the east and provides a moorage for local boats. Five families maintain racks close to their homes and these are situated away from the three major rack concentrations. Two of families also maintain racks on the other side of the river (Fig. 6).

The rack complex is characterized by a high proportion of a rack type referred to locally as uivutaq or nacalleq. These racks have a teepee-like framework of poles or small logs from 2 to 8 inches in diameter. From four to eight poles are stacked teepee-style and lashed on top where they meet. These racks range from 7 to 20 feet in diameter at the base and are 4 to 6-1/2 feet high at the apex. Teepee racks comprised approximately 26 percent of the total number of racks and were used by 19 of the 35 production units.

Some people stated that a teepee rack can hold more fish and takes up less area than a large log rack. One large teepee rack (13' x 6'10") held 1,512 fish or over 1,000 pounds. The closest comparable log rack (14'6" x 6') held 1,008 herring. Herring hung on teepees also do not have to be turned to insure complete drying. The braided strings of herring are wound around the teepee starting at the top. Each new string
is tied to the loose end of the preceding string. The fish hang straight down and are completely exposed to the air. Materials for teepee racks are easier to collect than the large logs needed for typical racks. Also they can be erected by one person. If additional drying racks are needed a teepee rack can be quickly erected. The one family that relied solely on the use of the teepee rack had just established a new rack facility across the river. They constructed the racks immediately after they finished harvesting herring.

The remainder of the racks in Toksook were made of logs between 4 and 10 inches in diameter. These racks were from 9 to 45 feet long and between 4 and 7-1/2 feet high.

The rack complex in Toksook Bay was very dynamic in 1986 compared to the other communities. People moved drying racks to new locations, dismantled old racks for parts, and made additions during the season. One family left their racks on the south side of town and moved their operation to racks along the river. Another left their racks near the road on the northside of town and moved across the river, because dust from the road was getting on the fish. A set of racks on the south side of town (Fig. 6) were abandoned recently after a leak from nearby fuel storage tanks fouled the area. These racks were used for materials by their owners.

A total of 64 households (83 percent; two households fished exclusively for Nightmute families making the actual Toksook Bay total equal 81 percent) participated in 35 production units (Table 6). Between one to six households were involved in a production unit for an average of 2.7 households per unit.
The number of individuals active as managers, harvesters, and processors ranged between two to nine in each production unit (Table 6). There were 108 fishermen and 116 processors in the 35 production units. The average number of fishermen per production unit was 3.1 with a range of one to five harvesters, while the average number of processors was 3.3 with a range of one to seven processors (Table 6).

The average age of the head of households with rack managers was 56, and their ages ranged between 31 to 81 years. Eighty-three percent were between 40 to 69 years of age. Females accounted for 11 percent of the heads of households which managed production units.

The 35 Toksook Bay production units owned and managed 132 drying racks of which 128.5 (97 percent) were used in 1986. Each production unit owned from one to eight racks. Sharing of gill nets was most widespread in Toksook Bay in 1986. The predominant use of commercial gear (gill nets of 50 fathoms in length) may have produced higher yields per net, especially during the peaks of the herring runs, which may account for more widespread sharing of gill nets, even between non-primary kin groups. Twenty-six gill nets were shared among the 35 production units. As many as four production units obtained herring from one gill net. Two Nightmute production units contributed one tide's catch of herring to the harvest of two Toksook Bay production units.

A total of 190 individuals were involved in the production of herring for subsistence in Toksook Bay (Table 6). Those who were involved as only processors made up 52 percent of the total, whereas harvesters accounted for 43 percent. Seven women and one man worked as both harvester and processor (5 percent of the total). Females (primarily being processors)
accounted for 53 percent of the total participants. Nine fishermen worked for more than one production unit, and three of these assisted a total of three families. Five processors worked for more than one production unit.

A total of 12 people from communities other than Toksook Bay participated in one of the 35 Toksook Bay production units (Table 6). The communities were Tununak, Newtok, Nightmute, Kipnuk, Eek, Bethel, Anchorage, and Seward.

Of the total population, 178 local people or 43 percent served as harvesters, processors, or managers (Table 6). Their ages ranged from 5 to 73 years of age.

Nightmute

The racks in Nightmute are closely associated with the residential dwelling of rack owners. Racks used for drying herring include the standard log racks, teepee-style racks and smaller racks commonly used to dry seal meat, salmon, and other species of fish. Racks in Nightmute are 9 to 41 feet long and 3 to 7 feet high. The three teepee racks used were from 9 to 15 feet wide at the base and between 4 and 7 feet high. As many as 6 racks were used by a single production unit. Only two subterranean storage pits were observed.

Fourteen production units composed of 18 local households (64 percent) were involved in the subsistence herring fishery in 1986 (Table 6). Including households from other communities, there was an average of 1.5 households per production unit in Nightmute with a range of one to three
households.

Three to eight persons were active in one of the 14 Nightmute production units with a total of 32 fishermen and 39 processors for an average of 2.1 fishermen and 2.6 processors per production unit. The maximum number of harvesters for a single production unit was three and the maximum number of processors was six.

Heads of "rack managing" households averaged 58 years of age and ranged between 34 to 84 years. Seventy-three percent were between 50 to 79 years of age. Fourteen percent of households with rack managers were headed by women.

The 14 Nightmute production units owned 49 racks, all of which were used in 1986. Two production units shared gill nets with Toksook Bay fishermen, so a total of 14 nets were set or used in drifting for herring by Nightmute fishermen.

A total of 54 Nightmute residents, or 36 percent of the population, was active in the production of herring for subsistence use (Table 6). The ages of local participants ranged from 13 to 76. They were assisted by six people from Toksook Bay, Chefornak, and Bethel, for a total involvement by 60 individuals (Table 6). There were 27 people who only harvested herring and 34 only processed herring. One woman worked at both tasks.

**Umkumiut**

A total of 24 racks were operated by nine production units at Umkumiut. Six of these were from Nightmute and three were from Toksook Bay. Because it is so closely associated with Toksook Bay and Nightmute,
information on processors and harvesters who worked in Umkumiat are included in discussions of their respective permanent villages.

DISCUSSION

The Nelson Island herring harvest represent a major subsistence use of herring in the Bering Sea. This research demonstrates that in 1986, residents of Tununak, Newtok, Toksook Bay, and Nightmute harvested an estimated 166.8 short tons of herring for subsistence use. Approximately 75 percent of all households in the four communities were involved in the subsistence herring fishery and produced an overall average of 308 pounds of herring per capita (Table 6).

The 1986 harvest estimate of 166.8 short tons for the four communities surveyed exceeds by 55 tons the most recent subsistence herring harvest estimates compiled for the entire Bering Sea region (Hemming et. al. 1978). That survey was done after a severe decline in local herring populations and may not be indicative of normal harvest levels. In 1983, Tununak subsistence fishermen alone harvested over 80 tons of herring (Pete 1984). Local fishing families considered it a very good year and one of the first in many years that the herring harvest approached past levels.

The degree of involvement by households and individuals in the subsistence herring fishery by harvesting and processing is considerable (Table 6). Preliminary analysis of detailed information gathered on the 1985 subsistence herring fishery show that all permanent residents of Tununak were part of a production or consumption unit. The local
family is the core of the production unit, but the extensive kin system of the Yup'ik brings more distant relations. The sharing of herring harvests extends also to friends and family in communities outside of Nelson Island.

While it is of unquestionable importance, the subsistence herring fishery is but a part of a larger cycle of resource use by residents of Nelson Island. Even during peak herring harvest periods, other subsistence activities occur simultaneously. Other species which are caught incidentally such as flounder and sculpin are brought home and processed. Some family members target other species while relatives are taking herring. The fall beach grass harvest is also a time for picking edible plants and hunting waterfowl. Because the arrival of herring is dependent on many factors fishing families must be flexible. Timing and geographic use areas fluctuate from year to year. Harvesters prefer taking fish close to home, but if conditions warrant it they will fish in places beyond their traditional use areas.

The 1986 herring runs were relatively large. Some community elders believed the impressive numbers of herring, in late May and June of 1986, resulted from the chance convergence of several separate herring stocks. They advised against feeling secure that all stocks have returned to normal. Local knowledge of herring stocks and conditions effecting their seasonal movements is extensive and should be recorded so it can be used to assist in the management of both the commercial and subsistence fisheries.

Like all aspects of a subsistence economy, the subsistence herring harvest is an important cultural activity as well as a vital economic
one. It was, before the advent of the commercial fishery, the first community-wide open-water activity of the season. Nelson Island residents have developed an adaptive and effective way to organize significant social groups to produce dried herring for their own consumption. The subsistence fishery and the new commercial fishery have thus far coexisted with no apparent disruption of the subsistence fishery. The interrelationship between the two uses of herring by local Nelson Island residents will no doubt be of continued interest to policy-makers and Nelson Island residents themselves.
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APPENDIX

Herring Fishery Survey
Division of Subsistence. Spring 1986

Village: __________________________ Interviewee: __________________________ H.H.#________

Fishing Time: __________________________ (Calendar Days)

No. of days—first herring run __________________________
No. of days—subsequent runs __________________________ TOTAL DAYS: __________________________

Fished before, during, or after commercial fishing? (Circle answer(s))

Set net site: __________________________ Drift area: __________________________

Gear type: Net length _____ Mesh size _____ Boat type _____ Length _____

Harvesting and Processing:
Same HH/Dif HH Relationship to H.H. Head

Who fished?

Who processed?

Harvest levels: 1 2 3 4 5

| Rack Length(s): | / | / | / | / | / | Teepee: (TOTAL STRINGS: | (TOTAL STRINGS: |
| Rack Height(s): | / | / | / | / | / | Milpengayilt: | Milpengayilt: |
| No. of Strings: | / | / | / | / | / | __________________________ | __________________________ |

How many containers of sac-roe were put up? (Asked after sac-roe is dried: determine container size).

General information: (Use back of page if necessary)

Was this year good, average, or less than average for catching herring? Why was it so?

Did you have any problems with the commercial or subsistence fishery (e.g. timing, weather, ice, competition for areas, sharing gear)?

Herring Roe-on-Kelp

Did anyone in your household collect herring roe-on-kelp (elquat)? Who collected? Where did collection occur? About how much was collected (determine container)?