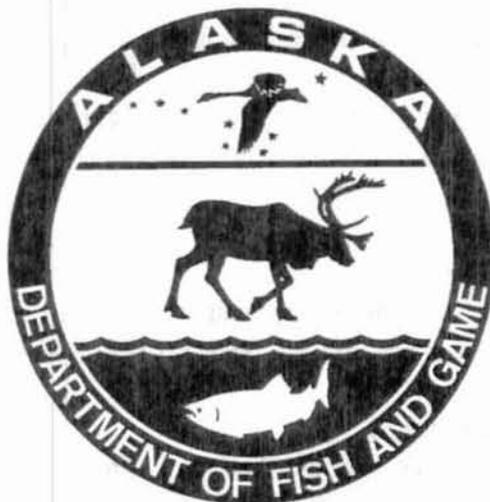


PACIFIC HERRING STOCKS AND FISHERIES IN THE
ARCTIC-YUKON-KUSKOKWIM REGION OF THE BERING SEA,
ALASKA, 2001 AND OUTLOOK FOR 2002



By

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INTRODUCTION

The objectives of this report are to summarize the results of the 2001 Pacific herring stock assessment programs for the Arctic-Yukon-Kuskokwim (AYK) Region, review 2001 management strategies and harvests in all AYK commercial and subsistence herring fisheries, and present harvest projections and general management strategies for the 2002 fishing season. The commercial fishing districts in this report are: Security Cove, Goodnews Bay, Cape Avinof, Nelson Island, Nunivak Island, Cape Romanzof, Norton Sound, and Port Clarence (Figures 1 and 2).

The Alaska Board of Fisheries established threshold biomass levels (below which commercial harvests are not allowed under the Bering Sea Herring Fishery Management Plan 5 AAC 27.060, ADF&G 2000) for all districts with the exception of the Port Clarence District. Commercial exploitation rates are limited to a maximum of 20% in all areas. In the Nelson Island and Cape Avinof Districts, the Board of Fisheries has further restricted exploitation rates to protect subsistence harvests. All AYK herring districts open and close by emergency order authority. The Nelson Island, Nunivak Island, Cape Romanzof, and Norton Sound herring fisheries were designated limited entry status in 1987. A moratorium to new entry was placed on the Goodnews Bay herring fishery starting in 1997. In Norton Sound, two spawn-on-kelp fisheries are allowed, an open pound spawn-on-kelp fishery and a wild spawn-on-kelp fishery. In the Nunivak Island District, a cooperative purse seine fishery was established beginning in 2000. In addition, all AYK Region commercial herring districts, except Security Cove and Port Clarence, are designated as superexclusive use areas.

A total biomass of 55,166 tons of herring was estimated to have been present in the surveyed portion, excluding Port Clarence, of the AYK Region herring districts in 2001 (Tables 1 and 2). The biomass distribution by district is presented in Figure 3. The 2001 return was 20% below the 5-year average (1996-2000) of 68,611 tons. The combined biomass of all districts was comprised of 31.4% young herring (age 5 or less), 29.0% middle-aged herring (ages 6-8) and 39.6% older herring (ages 9 and older). Ages 5 and 8 herring were the dominant age groups in all AYK districts comprising 39.9 % of the biomass. In numbers of fish, the percentage of recruits (age 5 or less) was 49.3%, the highest recruitment percentage since 1981-1982. This large recruitment is caused by increased numbers of ages 4 and 5 herring returning in all districts. DuBois (*in press*) presents information on sampling effort and age composition in 2001.

The 2001 herring harvest for the AYK Region was approximately 4,360 tons, a 33% decrease from the 2000 harvest of 6,531 tons (Tables 2 and 3). The harvest distribution by district is presented in Figure 4. The 2001 harvest was approximately one-half of the 5-year average (1996-2000) of 8,295 tons and was the smallest harvest since 1994. Most of the harvest was sold as sac roe product, except for 80 tons sold as bait in the Cape Romanzof District (Table 2). No waste herring was reported. The 2001 total exploitation rate for the AYK Region was 7.9%, the lowest rate since 1994. Exploitation rates, in areas with a commercial fishery, ranged from 0.8% in the Goodnews

Bay District to 19.7% in the Security Cove District (Table 2). The Nunivak Island and Port Clarence Districts did not have a commercial fishery in 2001.

Poor market conditions and the need for a high-quality product has helped produce high roe percentages in recent years. Roe recoveries in the sac roe harvest ranged from 7.6% in the Cape Romanzof District to 12.6% in the Norton Sound District, with a combined regional roe recovery of 11.6% (Table 2). Norton Sound had the highest roe recovery rate ever recorded for that district.

The 2001 estimated exvessel value for the AYK Region of \$563,000 was a record low value since the fishery began. The value has declined dramatically since the high value years of 1995 and 1996 (Table 2). The combined Kuskokwim Area districts as well as the Cape Romanzof District had record low values, and the Norton Sound District value was near the lower end of the historical range. The 2001 overall value is 19% of the 5-year average (1996-2000) of \$2,951,000 and only 6% of the record value of \$8,730,000 in 1996. The record low value in 2001 was caused in part by decreasing trends in harvest, effort and average price paid. In 2001, the average price paid to fishers for herring with 10% roe content in the AYK Region was \$100-150 per ton, compared to \$200 per ton in 2000 and \$200 to \$500 per ton in 1999.

A total of 270 permit holders participated in the AYK sac roe herring fisheries during the 2001 season (Table 4). Participation decreased in all districts compared to 2000. The number of AYK herring fishers participating in 2001 is 38% of the 5-year average (1996-2000) of 714 fishers and a record low effort since the fishery developed in the late 1970s. In the Norton Sound District, three fishers participated in the open pound spawn-on-kelp fishery. In the Nunivak Island and Port Clarence Districts, no fishers participated because processor interest was lacking.

Biomass projections are made for each district using postseason escapement estimates, historical mean rates of survival, current mean weights for each age class and assumed recruitment rates for each age class (Wespestad 1982). The projected 2002 spawning biomass of the northeastern Bering Sea herring stocks (Security Cove to Norton Sound) is 48,972 tons, with an allowable commercial harvest of 9,585 tons (Table 5). This is a slight decline from the 2001 biomass of 55,166 tons (Table 2). All districts, except Cape Avinof, have small projected declines, partly due to natural mortality as the predominant year class ages. These projections do not include age classes younger than age 4, usually not observed in the fishery.

Variability in survival rates and aerial survey assessments of biomass and deviations from the assumed survival or recruitment rates may result in the observed biomass being either above or below the biomass projection. Observed biomass estimates may be greater than expected if there are large numbers of recruit herring in 2002. Harvest levels may be adjusted inseason according to observed herring spawning biomass. If aerial survey methods cannot be used to determine herring abundance, stock abundance will be assessed using information from the projected biomass, test and commercial catches, and spawn deposition observations. In accordance with the AYK Region harvest strategy, the commercial fishery will not target newly recruited age classes

STOCK STATUS

Assessment Methods

The timing of the spawning migration of herring in the northeastern Bering Sea is greatly influenced by climate and oceanic conditions, particularly the extent and distribution of the Bering Sea ice pack. Most herring appear soon after ice breakup, which generally occurs between late-April and mid-June. Spawning usually begins in the Security Cove District and progresses in a northerly direction. In some areas, spawning may continue into July. In most Kuskokwim districts the spring spawning migration timing appeared to be early in 2001. In the Cape Romanzof and Norton Sound Districts, lingering ice resulted in later run timing.

Aerial survey techniques have been used since 1978 in the Bering Sea herring fisheries to estimate herring spawning biomass (Lebida and Whitmore 1985). However, biomass estimates from aerial surveys in the AYK Region are often difficult to obtain because of poor survey conditions caused by unfavorable weather, ice conditions or turbid water. Herring school surface areas are recorded in 538 ft² relative abundance index (RAI) units. In the AYK Region, RAI units are converted to biomass based on water depth. Because purse seine gear is needed to estimate the conversion factors and purse seine gear use is limited in the AYK Region, conversion factors developed in the Togiak District were used. Ground surveys are conducted in some districts to obtain information on the distribution and density of kelp beds and herring spawn deposition.

During 2001, 71 aerial surveys totaling 58.9 hours of flight time were flown in the AYK Region: 13 (5.8 hours) in Security Cove, 12 (7.4 hours) in Goodnews Bay, 3 in Cape Avinof (1.9 hours), 15 (4.9 hours) in Nelson Island, 3 (3.2 hours) in Nunivak Island, 3 (0.5 hours) in Jacksmith Bay, 6 (2.5 hours) in Cape Romanzof, 16 (32.7 hours) in Norton Sound and 0 in Port Clarence. Survey conditions were rated as fair or better in 31% of these surveys.

Gillnets are the only legal gear in the majority of the AYK Region, with the exception of Norton Sound where a portion of the harvest is normally taken using beach seine gear and Nunivak Island where a cooperative purse seine fishery is allowed. However, gillnets were the only gear fished in 2001. Additionally, Norton Sound recently established an open pound spawn-on-kelp fishery and a wild spawn-on-kelp fishery.

Herring from test fish and commercial catches were sampled to estimate age, sex, size, and sexual maturity, and to note the occurrence of other schooling fishes, in all but the Nunivak Island and Port Clarence Districts. An attempt was made to sample at least 420 herring from each commercial gear type, district or subdistrict per week. The sampling goal for department test fish catches was to sample a minimum of 60 herring per day or 420 per week from each district or subdistrict captured

using a variable-mesh gillnet¹ (VMG). A total of 9,870 herring from commercial gillnet, subsistence and VMG test catches were sampled during the 2001 fishing season. Security Cove age composition summaries were compiled using test fish samples from Security Cove and Goodnews Bay. The samples from these districts were combined because the majority of the Security Cove samples were collected after the commercial fishery, and using only the Security Cove samples may overestimate the younger age classes. Nunivak Island age composition summaries were estimated using samples from Nelson Island.

In most districts, fishers, in cooperation with the Department, provided catch samples for roe quality evaluation by industry representatives. Participation by fishers in collecting samples, processor evaluation of samples, and the flexibility of fishers to fish on short notice helped to increase roe recoveries.

Spawning Populations

Security Cove District

Since 1981, biomass estimates in the Security Cove District have ranged from 2,300 tons in 1987 to 8,267 tons in 1981 (Table 1). The herring biomass projected to return to this district in 2001 was 4,527 tons (DuBois 2000). Between May 2 and June 4, thirteen aerial surveys were flown in the district to estimate herring biomass and observe spawning activity. Six of these surveys were flown under acceptable conditions. The largest biomass, 4,308 tons, was observed on May 15. On June 4, 898 tons of herring was observed and was added to the May 15 biomass estimate to derive the total biomass estimate of 5,206 tons. A total of 20.5 miles of spawn was observed in the district, with peak spawning activity (5.5 miles) observed on May 15.

The Department's test fish crew sampled 935 herring caught with variable-mesh gillnets from May 11 to May 24 for biological data. Ages 4 and 5 comprised almost three-quarters of the samples. Managers believed these samples overestimated the younger age classes because most of the Security Cove samples were collected late in the season. Therefore, the age composition of the Security Cove District biomass was estimated by combining VMG samples from the Goodnews Bay and Security Cove Districts. Recruit herring, ages 2-5, represented 57.1% of the returning population (Figure 5). Ages 5 and 4 dominated the return in numbers of fish (28.5% and 28.4%, respectively). Ages 5, 8 and 4 comprised 21.9%, 17.4% and 16.2%, respectively, of the biomass (Figure 6). Age 9 and older herring comprised 34.8% of the biomass.

¹ The floating variable-mesh gillnet (VMG) is 100 ft (31 m) in length and 10 ft (3 m) in depth and consists of four 25 ft (8 m) panels with stretch mesh sizes of 1.5, 2.0, 2.5, and 3.0 inches (38, 51, 64, and 76 mm).

Goodnews Bay District

Since 1981, biomass estimates in the Goodnews Bay District have ranged from 2,000 tons in 1987 to 6,896 tons in 1999 (Table 1). The herring biomass projected to return to this district in 2001 was 5,755 tons (DuBois 2000). During the 2001 season, twelve aerial surveys were flown in the district between May 2 and June 4 to estimate herring biomass and observe spawning activity. Four of these surveys were flown under acceptable conditions. The largest biomass, 5,207 tons, was observed on May 15 under fair conditions. Because of poor aerial survey conditions in 2001, the total biomass present in the district was based on the preseason projection. Approximately 3.5 miles of spawn was observed in the district with the greatest amount (1.5 miles) observed on May 15.

The Department's test fish crew sampled 1,283 herring caught with variable-mesh gillnets from May 7 to May 26 for biological data. Recruit herring, ages 2-5, represented 45.8% of the returning population (Figure 5). Ages 4 and 5 dominated the return in numbers of fish (23.3% and 22.3%, respectively). Ages 8, 5 and 10 herring comprised 17.1%, 16.0% and 15.5%, respectively, of the biomass (Figure 6). Age 9 and older herring comprised 44.7% of the biomass.

Cape Avinof District

Since 1985, biomass estimates in the Cape Avinof District have ranged from 1,225 tons in 1987 to 4,600 tons in 1997 (Table 1). The herring biomass projected to return to this district in 2001 was 3,486 tons (DuBois 2000). The district consists of shallow mud flats where turbidity, caused by wind and wave action, often limits visibility. The last year in which the herring biomass was estimated by survey was 1992, when 3,446 tons were observed. In other years, the preseason projection or commercial harvest rates have been used to estimate herring biomass. Between June 2 and June 5, three aerial surveys were flown in the district to estimate herring biomass and observe spawning activity. Two of these surveys were flown under acceptable conditions. The largest biomass, 993 tons, was observed on June 5. Due to poor aerial survey conditions in 2001, the total biomass present in the district was based on the preseason projection. A total of 5.0 miles of spawn was observed in the district, with peak spawning activity (3.0 miles) observed on June 4.

The Department's test fish crew sampled 493 herring caught with variable-mesh gillnets from June 2 to June 8 for biological data. Cape Avinof had the largest component of recruit herring, 62.1%, of any district in the region (Figure 5). Ages 4 and 5 dominated the return in numbers of fish (32.3% and 29.6%, respectively). Ages 5, 4 and 8 herring comprised 24.6%, 20.6% and 16.3%, respectively, of the biomass (Figure 6). Age 9 and older herring comprised 25.1% of the biomass.

Nelson Island District

Since 1985, biomass estimates in the Nelson Island District have ranged from 2,385 tons in 1991 to 9,500 tons in 1985 (Table 1). The herring biomass projected to return to this district in 2001 was 3,971 tons (DuBois 2000). Fifteen aerial surveys were flown between May 21 and June 5 to estimate herring biomass and observe spawning activity. None of these surveys were flown under acceptable conditions. The largest biomass, 2,407 tons, was observed on June 4 under poor conditions. Harvest rates during the fishery indicated that the biomass present in the district was larger than the pre-season projection. The total biomass present in the district was assessed to be 6,057 tons based on commercial harvest rates. Approximately 2.5 miles of spawn was observed in the district with the greatest amount (1.0 miles), observed on June 1.

The Department's test fish crew sampled 1,494 herring caught with variable-mesh gillnets from May 18 through June 12 for biological data. Recruit herring represented 40.6% of the spawning population (Figure 5). Ages 5 and 8 herring dominated the return in numbers of fish (25.3% and 19.2%, respectively). Ages 8, 5 and 10 herring comprised 22.7%, 17.5% and 16.4%, respectively, of the biomass (Figure 6). Age 9 and older herring comprised 40.0% of the biomass.

Nunivak Island District

Since 1985, biomass estimates in the Nunivak Island District have ranged from 422 tons in 1990 to 6,000 tons in 1986 (Table 1). The herring biomass projected to return to this district in 2001 was 3,411 tons (DuBois 2000). During the 2001 season, three aerial surveys were flown between June 2 and June 5 to estimate herring biomass and observe spawning activity. All of these surveys were flown under acceptable conditions. The largest biomass, 5,657 tons, was observed on June 5 under good conditions. This was adopted as the biomass estimate for 2001. A total of 4.2 miles of spawn was observed in the district, with peak spawning activity observed on June 5 (2.1 miles).

The Department's test fishing with variable-mesh gillnets was not conducted in the Nunivak Island District because of a lack of funding. Age composition of the Nunivak Island herring biomass was estimated using VMG samples from the Nelson Island District. Recruit herring represented 40.6% of the spawning population (Figure 5). Ages 5 and 8 herring dominated the biomass (Figure 7) and the return in numbers of fish. Age 9 and older herring comprised 40.0% of the biomass.

Central Kuskokwim Bay

The Central Kuskokwim Bay area extends from Jacksmith Bay, south of Quinhagak, to the Ishkowik River. No commercial herring fishing districts are located in this area. Three aerial surveys were flown in this area from May 2 to June 4. None of these surveys were flown under acceptable conditions and no biomass or spawning activity was observed.

Cape Romanzof District

Excessive water turbidity in the Cape Romanzof area often prevents using aerial survey techniques to estimate herring biomass. Based on information from limited aerial surveys, test and commercial catches, and spawn deposition, the estimated herring biomass in the Cape Romanzof District has ranged from approximately 2,700 to 7,500 tons since 1981 (Table 1). Six aerial surveys were flown during the 2001 season from May 23 through June 15. None of these surveys were flown under acceptable conditions and no biomass or spawning activity was observed. Based on spawn deposition study results, commercial and test fishery catch rates, herring age composition and the preseason projection, the 2001 biomass of herring in the Cape Romanzof District was estimated to be between 2,400 and 3,000 tons. This is a decrease from the 2000 biomass estimate of between 3,000 and 4,000 tons (DuBois 2000).

Artificial spawning substrates (platforms), used to develop a spawn deposition index, were located in the same general spawning locations used since 1992. Forty platforms were in place from May 17 through June 13. Light spawn deposition occurred in the study area on June 6 and 7. Spawning also occurred on June 9 but most of the observed spawning deposition was outside of the study area. The amount of spawn deposition recorded in the study area was among the lowest on record. Foot surveys conducted south of the study area indicated average to above average spawn deposition compared to previous years. Late spring conditions, lingering ice and constant northerly winds may have influenced spawning patterns in 2001. The spawning platform study results in 2001 are not believed to be indicative of the total spawning biomass within the entire district because most of the spawning occurred outside the study area.

The Department's test fish crew sampled 867 herring caught with variable-mesh gillnets from June 1 to June 13 for biological data. Recruit herring represented 46.0% of the spawning population (Figure 5). Ages 5 and 8 herring dominated the return in both biomass (22.8% and 22.1%, respectively, Figure 7) and numbers of fish (32.1% and 18.9%, respectively). Age 9 and older herring comprised 38.9% of the biomass.

Norton Sound District

Historically, the primary spawning areas within Norton Sound have been from Stuart Island to Tolstoi Point (Figure 2). When the first tenders arrived on May 25, shorefast or broken ice was present from Stuart Island to Unalakleet and from Shaktoolik to Cape Denbigh. Substantial breakup of shorefast ice in southern Norton Sound occurred on May 29. A late spring and lingering ice conditions caused the spring spawning migration to be later than average.

Since 1978, herring biomass estimates in the Norton Sound District have ranged from 5,291 tons in 1978 to 57,974 tons in 1992 (Table 1). The herring biomass projected to return in 2001 was 26,305 tons (DuBois 2000). Sixteen aerial surveys were flown between May 18 and June 25. The presence of fog and low clouds permitted only seven surveys to be flown in acceptable conditions.

Herring were first sighted in the district along the west side of Cape Denbigh on May 28 (Figure 2). Spawning was also first observed near Cape Denbigh on June 11. The largest biomass estimate for the district, 11,511 tons, was observed late in the season on June 21 and consisted of herring in spawned-out configurations. The Department believes the peak biomass occurred between June 13 and June 15 when weather prevented an acceptable survey. Due to poor aerial survey conditions in 2001, the total biomass present in the district was based on the preseason projection of 26,305 tons. A total of 20.5 miles of spawn was observed in the district, with peak spawning activity (7.5 miles) observed on June 14.

Three Department test fish crews operated during the 2001 season. One crew operated in northern Norton Sound at Cape Denbigh. The deployment of the second crew at Klikitarik was delayed until after the commercial fishery began because of the presence of ice in southern Norton Sound. A third test fish crew was based in Unalakleet. The test fish crews sampled 1,795 herring caught with variable-mesh gillnets from June 1 through June 19 for biological data. Recruit herring represented 50.3% of the return in numbers of fish (Figure 5). Ages 5 and 4 herring were the most abundant age classes in numbers of fish (27.2% and 23.1%, respectively). Ages 8 and 5 herring comprised 21.4% and 19.4%, respectively, of the biomass (Figure 7). The biomass consisted of 41.2% age 9 and older herring.

Port Clarence District

Generally, the presence of ice, poor water clarity, or poor weather has prevented aerial surveys in this district. In addition, herring identification is difficult because of the large numbers of saffron cod, whitefish, and other pelagic species typically present in the area. The record biomass for this district of 1,652 tons was sighted during an aerial survey in 1992 (Table 1). No surveys were flown in the Port Clarence District during 2001.

SUBSISTENCE FISHERY

Pacific herring are an important component in the diets of many Yukon-Kuskokwim Delta village residents. Subsistence herring harvest surveys have been conducted annually in Yukon Delta villages and sporadically in Kuskokwim Delta villages since 1975. Subsistence Division has conducted subsistence surveys during several years since 1990 in the Nelson Island and Nunivak Island Districts (Pete 1990, 1991, 1992, 1993). However, herring subsistence surveys have not been conducted in the Nelson Island District since 1996 or in the Nunivak Island District since 1993 (Table 6). Available data suggest that Nelson Island villages harvest approximately 110 tons of herring annually (Pete 1992).

Mail-out questionnaires were used to collect subsistence harvest information from the Yukon Delta villages of Hooper Bay, Chevak, and Scammon Bay in 2001. This year, personal interviews were not conducted to collect subsistence herring harvest data. Subsistence herring survey questionnaires were mailed to 209 fishing households and 49 or 23% were returned. The reported subsistence harvest was 3 tons of herring taken by 23 fishing households from the Yukon Delta villages (Table 6). In addition, seven households harvested 188 pounds of herring spawn on *Fucus* kelp for subsistence use. The subsistence harvest and effort figures represent only the harvest that was reported. Therefore, the reported harvest is a minimum estimate since not all fishing families were contacted and not all households who received questionnaires returned them.

The Department sampled 360 herring for biological data from the subsistence harvest in the Nelson Island District. Age 5 herring comprised 63.4% of the subsistence samples. The samples consisted of 71.0% recruit-aged herring and 7.8% age 9 and older herring.

COMMERCIAL FISHERY

Security Cove District

The total herring harvest of 1,024 tons had an average roe content of 10.7% (Tables 2 and 3). Six processors purchased herring from 56 permit holders who made 209 deliveries in four periods with 17.5 hours of total fishing time (Tables 4 and 7). The estimated exvessel value was \$110,000. The exploitation rate was 19.7% of the available biomass (Table 2).

On May 17, the fishery opened for two hours at 12:30 AM. Forty-one permit holders delivered 88.7 tons of sac roe quality herring with an average roe content of 10.3%. The second and third periods occurred on the afternoon tides of May 18 and May 19 with harvests of 293.7 and 379.6 tons. The final period occurred on May 19 with a harvest of 262.5 tons (Table 7). Additional herring observed during an aerial survey on June 4 resulted in the GHLL level being increased from 905 to 1041 tons. The Security Cove harvest accounted for 23.5% of the total AYK Region harvest (Figure 4). Fishers were allowed to use 100 fathoms of gillnet for all openings.

A total of 423 herring were sampled from the commercial catch. Ages 8 and 10 herring dominated the harvest biomass (31.9% and 26.9%, respectively, Figure 6). Age 9 and older herring made up 62.8% of the catch. Recruit-age herring comprised less than 1.0% of the harvest.

Goodnews Bay District

The total herring harvest was 45 tons with an average roe content of 11.3% (Tables 2 and 3). One processor purchased herring from 23 permit holders who made 51 deliveries in three periods from May 21 through May 22 with 16.0 hours total fishing time (Tables 4 and 7). The estimated exvessel value was \$6,000. The exploitation rate was 0.8% of the available biomass (Table 2).

On May 21, the first period was 5 hours long beginning at 5:00 PM. Sixteen permit holders delivered 15.0 tons of herring with an average roe content of 11.7%. On the morning and afternoon tides of May 22 the second and third fishing periods occurred with a combined harvest of 30.3 tons (Table 7). Fishing was discontinued after May 22 due to lack of processor interest. Contributing to lack of processor interest was the decline in fishing effort in the district. A record low number of fishers participated in 2001. The 23 fishers in 2001 were only 20% of the 10-year average effort and well below the record of 182 fishers in 1996 (Table 4).

A sample of 207 herring was taken from the commercial harvest. Ages 10, 11 and 8 herring comprised 29.4%, 23.0% and 21.3%, respectively, of the harvest (Figure 6). Age 9 and older herring made up 66.6% of the harvest. Recruit-age herring comprised less than 1.0% of the harvest.

Cape Avinof District

The total herring harvest was 231 tons with an average roe content of 9.8% (Tables 2 and 3). One processor purchased herring from 45 permit holders who made 208 deliveries in nine periods with a total fishing time of 63.0 hours (Tables 4 and 7). The estimated exvessel value was \$23,000. The exploitation rate was 6.6% (Table 2) based on the pre-season biomass projection of 3,486 tons (DuBois 2000).

On June 4 the first period opened for five hours at 8:00 AM. Nine permit holders landed 12.1 tons of herring with an average roe content of 9.9%. The district was reopened eight more times between the evening of June 4 and June 8. Harvest by period ranged from 1.5 tons on June 7 to 64.4 tons on the June 4 evening tide (Table 7). Average roe contents ranged from 9.3% to 11.6%.

A total of 421 herring were sampled from the commercial harvest. Ages 8 and 10 herring dominated the harvest biomass (35.2% and 22.5%, respectively, Figure 6). Age 9 and older herring made up 57.5% of the harvest. Recruit-age herring comprised less than 1.0% of the harvest.

Nelson Island District

The total harvest was 678 tons of herring with an average roe content of 10.4% (Tables 2 and 3). One processor purchased herring from 49 permit holders who made 237 deliveries in six periods with a total fishing time of 26.5 hours (Tables 4 and 7). The estimated exvessel value was \$66,000. The exploitation rate was 11.2% of the available biomass (Table 2).

On May 29 the fishery opened for two hours at 12:30 AM and no herring were harvested. The second opening occurred on the afternoon tide of May 29 when 4.2 tons of herring were harvested. Harvests increased during the next three openings and ranged from 177.6 tons on May 30 to 253.2 tons on May 31. The last period was on June 8 when 46.1 tons were harvested (Table 7). Only 50 fathoms of gear was allowed during the last period because of limited processing capacity.

A total of 425 herring were sampled from the commercial harvest. Age 10 herring was the dominant age class, comprising 29.2% of the harvest (Figure 6). Age 9 and older herring comprised 78.2% of the harvest. Recruit-age herring comprised less than 1.0% of the harvest.

Nunivak Island District

There was no commercial fishery in the Nunivak Island District in 2001 because of a lack of processor interest.

Cape Romanzof District

Twenty-four fishers harvested a total of 137 tons of herring in 2001 (Tables 2, 3 and 4). The commercial harvest was 80% below the recent five-year average (1996-2000) of 678 tons and was the lowest harvest on record since the fishery developed in the 1980s. Sac roe comprised 42%, or 57 tons of the harvest (Table 2). The average sac roe recovery was 9.8%. A total of 80 tons of herring were purchased as bait with an average roe recovery of 6.0%. The large amount of bait herring was due to partially spawned out females, immature herring and a high proportion of males occurring in the commercial harvest. The commercial harvest was well below the preseason harvest range of 466 to 566 tons (DuBois 2000). The commercial fishery consisted of four fishing periods between June 4 and 7. Fishing period duration ranged from 2.0 hours to 5.0 hours with a total fishing time of 13.5 hours (Table 7). Fishing gear was restricted to one 50-fathom gillnet per vessel throughout the commercial season. A late spring resulted in lingering shore ice for the duration of the fishery.

The estimated exvessel value of the harvest was \$9,700 (Table 2). This is the lowest value on record for the Cape Romanzof fishery and only 4.2% of the recent five-year average (1996-2000) value of \$232,000. Average price for sac roe herring was \$100 per ton at 10% roe recovery, and the bait herring price averaged \$50 per ton. One company purchased herring during the fishery (Table 4).

Fishing effort was 38% of the five-year average (1996-2000) of 54 fishers. Local Alaskan residents (defined as residents of Chevak, Hooper Bay, and Scammon Bay) accounted for all of the effort and harvest. The exploitation rate was 5.1% of the available biomass (Table 2).

A total of 200 herring were sampled from the commercial harvest. Ages 13 and 8 herring dominated the harvest biomass (27.8% and 23.6%, respectively, Figure 7). Age 9 and older herring comprised 73.5% of the harvest. Recruit-age herring were not present in the harvest.

Norton Sound District

Sac Roe Fishery

The total harvest during the sac roe fishery was 2,245 tons of herring with an average roe recovery of 12.6% (Tables 2 and 3). No waste or bait herring were reported. The 2001 harvest was 55.9% of the 5-year average (1996-2000) harvest of 4,015 tons. This was the smallest harvest since 1994 and represented 51.5% of the total AYK harvest (Figure 4). The exploitation rate was 8.5% of the available biomass of 26,305 tons (Table 2). Only 73 gillnet fishers of a possible 320 permit holders participated in the fishery (Table 4).

The gillnet fishery was first opened in Subdistricts 2 and 3 on June 12. Six additional periods were allowed from June 13 through June 19 for a total of 84.0 hours of fishing time (Table 7). The sac roe harvest of 2,245 tons was all taken with gillnets. Table 8 presents the historical beach seine and gillnet commercial harvests in the Norton Sound District. No beach seine permit holders fished in 2001 because of a lack of processor interest. Fishers were restricted to one 50-fathom gillnet throughout the season because of low processing capacity and the presence of ice in southern Norton Sound.

Three companies were present on the grounds during the season to purchase herring (Table 4). These three companies registered three processors and 13 tenders to operate in Norton Sound. Based on final operations reports, the average price advanced was \$133 per ton at 10% roe recovery. The total value of the herring harvest to Norton Sound fishers was \$348,000 (Table 2), 23.9% of the five-year (1996-2000) average value of \$1,454,000.

A total of 967 herring were sampled from the commercial harvest. Age 13 herring dominated the harvest, comprising 40.3% of the catch by weight (Figure 7). Age 9 and older herring represented 88.1% of the harvest. Recruit-age herring comprised less than 1% of the harvest.

Spawn-on-Kelp Fisheries

Two herring spawn-on-kelp fisheries are allowed under regulation, one utilizing imported *Macrocystis* kelp deployed in open pounds and one harvesting spawn on wild *Fucus* kelp (5 AAC 27.965 and 5 AAC 27.934, ADF&G 2000). Five permit holders registered as participants in the fourth year of the open pound fishery. Three permit holders deployed kelp and harvested 4,400 pounds of product (Table 6). The wild spawn-on-kelp fishery did not occur in 2001 because of a lack of markets.

Timing is one of the most critical factors in the open pound fishery. The operators must predict spawning, at least five days in advance, to allow adequate time for the *Macrocystis* kelp to be harvested in southeast Alaska, delivered to Norton Sound and deployed in pounds. This year the main wave of spawn began on June 13, however, broken ice flows prevented the deployment of kelp until the evening of June 14. Overall quality of the product was average to poor. Although the spawn on *Macrocystis* kelp product has been processed, the final sales are not complete and value figures are not yet available.

Port Clarence District

There has not been a commercial sac roe fishery in the Port Clarence District since 1988 because buyers have not been present in the district. A small bait fishery with a harvest of less than 10 tons occurs in most years. However, there was no bait fishery in Port Clarence in 2001.

ENFORCEMENT

The Division of Fish and Wildlife Protection (FWP) was present in Security Cove, Goodnews Bay, Nelson Island, Cape Romanzof and Norton Sound Districts this year. Most fishers complied with fishery period opening and closing times and buyers were timely and accurate with verbal reporting of purchases. Three FWP officers were involved in the Kuskokwim Bay herring fisheries. These officers utilized a Supercub and a Cessna 185 aircraft. Details on the number and type of violations observed are not available from FWP at this time. Protection efforts in Norton Sound consisted of two FWP officers utilizing two single engine aircraft and a small boat. Three citations were issued

for fishing without an ADF&G Number Plate displayed on the vessel and 30 warnings were given for no photo identification.

OUTLOOK AND MANAGEMENT STRATEGY FOR 2002

Projections from postseason escapement estimates suggest that the 2002 spawning biomass for northeastern Bering Sea herring stocks (Security Cove to Norton Sound) will be 48,972 tons, with an anticipated allowable harvest of 9,585 tons (Table 5). The methods for projecting herring returns in the AYK region are described in Hamner and Bromaghin (1999). If the return is as expected, a small reduction in biomass will be observed in all districts except Cape Avinof. This decline is primarily caused by natural mortality of the dominant, older year classes.

Variability in the quality of aerial survey assessments of biomass and deviations from the assumed survival or recruitment rates may result in the observed biomass being either above or below these projections. Therefore, guideline harvest levels may be adjusted during the season according to observed herring spawning biomass. If determining herring abundance using aerial survey methods is not possible, stock abundance will be assessed using information from the projected biomass, test and commercial catches and spawn deposition observations. In addition, in accordance with the AYK Region harvest strategy, the commercial fishery will not target newly recruited age classes (age 2 through age 5 herring). In all districts, the Department will work cooperatively with fishers and buyers to optimize roe recovery during the 2002 season. Declining market conditions are expected to affect fishing harvest, effort and value in 2002. In each district, the occurrence and length of fishing periods will depend on inseason abundance estimates, roe quality, spawning activity, weather conditions, fishing effort and processor interest.

Security Cove District

The 2002 projected return to the Security Cove District is 4,487 tons. A 20% exploitation rate would result in a harvest of 897 tons (Table 5). Commercial fishing will not be allowed until the observed biomass reaches 1,200 tons, or significant spawning activity is observed.

The estimated 2002 herring age composition was calculated by combining data from the Security Cove and Goodnews Bay districts. Ages 6, 5 and 9 are expected to comprise 69.3% of the returning biomass (28.9%, 27.1% and 13.3%, respectively). Age 9 and older herring are expected to comprise 32.9 % of the biomass.

Goodnews Bay District

The management strategy for this district will be similar to that planned for Security Cove. The season will open and close by emergency order when a biomass of 1,200 tons, or significant spawning activity is observed. The 2002 projected return of herring to the Goodnews Bay District is 5,529 tons. A 20% exploitation rate would result in a harvest of 1,106 tons (Table 5).

Ages 6, 5, and 9 herring are expected to dominate the biomass, contributing 19.1%, 18.7%, and 16.8%, respectively. Age 9 and older herring are expected to comprise 51.0% of the biomass.

Cape Avinof District

Either significant spawning activity or a biomass of 500 tons must be observed before the commercial herring season can be opened. The 2002 projected biomass for the Cape Avinof District is 3,491 tons (Table 5). The exploitation rate will be no greater than 15% because of the limited database for this area and to ensure the subsistence fishing priority. A 15% commercial exploitation rate would result in a harvest of 524 tons.

Ages 5, 6 and 9 are expected to comprise 69.5% of the returning biomass (28.0%, 27.9% and 13.6%, respectively). Age 9 and older herring are expected to comprise 30.3% of the biomass.

Nelson Island District

In the Bering Sea Herring Fishery Management Plan, the Alaska Board of Fisheries set a minimum biomass threshold of 3,000 tons for the Nelson Island District. The inseason estimate of herring biomass must exceed the threshold level before a commercial fishery can be allowed.

The spawning biomass projected to return in 2002 to the Nelson Island District is 5,296 tons (Table 5). At an exploitation rate of 20%, minus 200 tons for subsistence harvest, the commercial harvest will be 859 tons.

To provide additional protection for the subsistence herring fishery, the following guidelines will be followed:

1. Two hundred tons of the exploitable biomass will be set aside for subsistence.
2. Periodic closures of the commercial fishery will be scheduled, during which only subsistence fishing will be allowed.

3. Several important subsistence use areas occur throughout the district, including the waters around Cape Vancouver. Specific areas may be closed to commercial fishing to insure the adequacy of subsistence harvests.
4. The Department will by all available means, including acting on input from local residents, insure the adequacy of subsistence herring harvests during the commercial fishing season.

Ages 6, and 9 are expected to dominate the returning population, contributing 23.9% and 22.2%, respectively. Age 9 and older herring are expected to comprise 49.7% of the biomass.

Nunivak Island District

The biomass of herring projected to return in 2002 to the Nunivak Island District is 5,422 tons. A 20% exploitation rate would result in a harvest of 1,084 tons (Table 5). The commercial season will open when the biomass reaches 1,500 tons, or when significant spawning is observed.

Ages 6 and 9 are expected to dominate the returning biomass. Age 9 and older herring are expected to comprise one-half of the return.

Cape Romanzof District

The projected biomass for 2002, based on limited data, is expected to be between 2,017 and 2,552 tons based on an assessed biomass of between 2,400 and 3,000 tons in 2001. The midpoint of this range for 2001 was 2,700 tons, which results in a projected biomass of 2,284 tons. At a 20% exploitation rate, the guideline harvest based on this projection would be 457 tons (Table 5). The allowable harvest is expected to range from approximately 403 to 510 tons and will be based on inseason indicators of abundance. Since water turbidity in the Cape Romanzof area generally prevents aerial observations of herring, spawn deposition and test and commercial catch rates will be used to determine the timing and duration of commercial fishing periods.

Ages 6 and 9 herring are expected to dominate the biomass, contributing 29.1% and 23.2%, respectively. Age 9 and older herring are expected to comprise 47.6% of the return.

Norton Sound District

The biomass projected to return in 2002 to Norton Sound is 22,463 tons. A 20% exploitation rate would result in a harvest guideline of 4,493 tons (Table 5). A maximum of 320 tons of herring are reserved to allow for the pound fishery to harvest a maximum of 90 tons of product (combined weight of herring roe and kelp) (5AAC 27.965, ADF&G 2000). This leaves 4,173 tons for sac roe harvest. The beach seine harvest is, by regulation, 10% of the sac roe projected harvest, or 417 tons. Inseason assessment of herring biomass will supersede projected biomass for management of the Norton Sound herring fishery, except where weather prevents obtaining an inseason estimate.

The 2002 herring fishery will be opened by emergency order and the fishery will close by emergency order when up to 20% of the available herring biomass has been harvested. Varied harvest rates may be applied to individual subdistricts based on biomass distribution, roe quality, weather, and sea ice conditions.

Ages 6, 9 and 5 are expected to dominate the returning biomass (24.2%, 21.4% and 19.5%, respectively). Age 9 and older herring are expected to comprise 49.7% of the return.

Port Clarence District

Generally, the Department does not project an outlook for the Port Clarence fishery because of the lack of data on Port Clarence herring and the limited scope of the fishery. The guideline harvest of 165 tons established by the Board of Fisheries in 1981 will determine the allowable harvest in 2002. This harvest guideline is based on two years of research conducted by the Department in both the Port Clarence and Kotzebue Districts. Even though this guideline has not appeared in the regulation book since 1984, it still represents the best estimate of harvestable biomass.

LITERATURE CITED

- ADF&G (Alaska Department of Fish and Game). 2000. 2000-2001 Commercial herring fishing regulations. Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau.
- DuBois, L. 2000. Pacific herring stocks and fisheries in the Arctic-Yukon-Kuskokwim Region of the Bering Sea, Alaska, 2000. A report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A00-31, Anchorage.
- DuBois, L. (*in press*). Age, sex, and size composition of Pacific herring from coastal Bering Sea spawning sites in the Arctic-Yukon-Kuskokwim Region, 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report, Anchorage.
- Hamner, H.H. and J.F. Bromaghin. 1999. Forecast of stock abundance for 2000 Arctic-Yukon-Kuskokwim Region herring fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A99-40, Anchorage.
- Lebida, R.C. and D.C. Whitmore. 1985. Bering Sea Herring Aerial Survey Manual. Alaska Department of Fish and Game, Division of Commercial Fisheries, Bristol Bay Data Report No. 85-2, Anchorage.
- Pete, Mary C. 1990. 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.
- Pete, Mary C. 1991. Subsistence-Herring Fishing in the Nelson Island and Nunivak Island Districts, 1991. A Report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Subsistence, Juneau.
- Pete, Mary C. 1992. Subsistence-Herring Fishing in the Nelson Island and Nunivak Island Districts, 1992. Alaska Department of Fish and Game, Division of Subsistence, Juneau. Technical Paper No. 221.
- Pete, Mary C. 1993. Subsistence-Herring Fishing in the Nelson Island and Nunivak Island Districts, 1992. Alaska Department of Fish and Game, Division of Subsistence, Juneau. Technical Paper No. 192.
- Wespestad, V.G. 1982. Cohort analysis of catch data on Pacific herring in the eastern Bering Sea, 1959-81. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Technical Memorandum NMFS F/NWC-24, Seattle.

Table 1. Pacific herring estimated biomass in the northeastern Bering Sea, Alaska, 1978-2001.

Year	Herring (tons)								
	Security Cove	Goodnews Bay	Cape Avinof	Nelson Island	Nunivak Island	Cape Romanzof ^a	Norton Sound	Port Clarence	Total Biomass
1978	1,323	441	-	5,952	805	2,976	5,291	-	16,788
1979	21,495	7,385	-	5,952	-	2,976	7,716	-	45,524
1980	1,213	1,213	-	5,952	-	2,976	8,377	-	19,731
1981	8,267	4,299	-	3,968	19	4,850	22,360	-	44,331
1982	5,071	2,646	-	3,968	-	4,850	19,403	-	33,951
1983	6,393	3,197	-	7,275	7,606	5,512	26,841	-	58,092
1984	5,071	4,079	-	11,023	6,695	6,063	21,475	-	56,079
1985	4,900	4,300	2,000	9,500 ^b	5,700 ^b	7,000	20,000	-	51,400
1986	3,700 ^b	3,000 ^b	-	7,300 ^b	6,000	7,500	28,100	-	55,600
1987	2,300 ^b	2,000 ^b	1,225	8,100	4,400 ^b	7,200	32,370	932	57,332
1988	4,906	4,479	4,108	7,152	2,800 ^b	6,600	33,924	788	64,757
1989	2,830	4,040	2,780 ^b	3,320	620	4,400	25,981	-	43,970
1990	2,650	2,577	2,020 ^b	2,705	422	4,500	39,384	-	54,258
1991	4,434	4,387	2,083	2,385	3,903	4,500	42,854	-	64,546
1992	7,773	5,572	3,446	5,275	5,703	4,500	57,974	1,652	91,895
1993	6,995	6,211	2,837 ^b	4,944	5,176	4,000	46,549	822	77,534
1994	7,638 ^b	5,679 ^b	2,827 ^b	5,564	4,921	5,000	37,829	92	69,550
1995	6,702 ^b	4,219 ^b	3,627 ^b	7,754	4,579 ^b	5,000	37,779	-	69,660
1996	6,867	6,315	4,500 ^b	6,638 ^b	4,195 ^b	6,000	27,307 ^b	-	61,822
1997	4,640 ^b	4,752 ^b	4,600 ^b	7,900 ^b	3,801 ^b	5,000 ^c	47,791	-	78,484
1998	4,017 ^b	4,064 ^b	4,287 ^b	7,136 ^b	3,778 ^b	4,500 ^d	52,033	-	79,815
1999	5,261	6,896	3,555 ^b	6,655	3,319 ^b	3,800 ^e	34,314	-	63,800
2000	5,237	6,348	3,210 ^b	4,672 ^b	3,487	3,500 ^f	32,680	-	59,134
2001	5,206	5,755 ^b	3,486 ^b	6,057 ^b	5,657	2,700 ^g	26,305	-	55,166

^a Biomass estimate based on limited aerial survey information, spawn deposition, age composition, and CPUE from commercial and test fisheries.

^b Unacceptable aerial survey conditions for estimating herring biomass, therefore projected biomass or some other method of estimating biomass was used.

^c Biomass listed for Cape Romanzof is midpoint for estimated range of 4,500 to 5,500 tons.

^d Biomass listed for Cape Romanzof is midpoint for estimated range of 4,000 to 5,000 tons.

^e Biomass listed for Cape Romanzof is midpoint for estimated range of 3,300 to 4,300 tons.

^f Biomass listed for Cape Romanzof is midpoint for estimated range of 3,000 to 4,000 tons.

^g Biomass listed for Cape Romanzof is midpoint for estimated range of 2,400 to 3,000 tons.

Table 2. Estimated biomass and commercial harvest of Pacific herring in northeastern Bering Sea fishing districts, Alaska, 1994-2001.

Year	District	Estimated Biomass(tons)	Harvest (tons)				Total	Roe %	Estimated Value (\$ x 1,000)	Exploitation Rate (%)
			Sac roe	Bait	Waste					
2001	Security Cove	5,206	1,024	0	0	1,024	10.7	110	19.7	
	Goodnews Bay	5,755 ^a	45	0	0	45	11.3	6	0.8	
	Cape Avinof	3,486 ^a	231	0	0	231	9.8	23	6.6	
	Nelson Island	6,057 ^a	678	0	0	678	10.4	66	11.2	
	Nunivak Island ^b	5,857	-	-	-	-	-	-	-	
	Cape Romanzof	2,700 ^a	57	80	0	137	7.6	10	5.1	
	Norton Sound	26,305 ^a	2,245	0	0	2,245	12.6	348 ^c	8.5	
Total		55,166	4,280	80	0	4,360	11.6	563	7.9	
2000	Security Cove	5,237	284	15	0	299	10.7	62	5.7	
	Goodnews Bay	6,348	19	1	1	20	9.2	3	0.3	
	Cape Avinof	3,210 ^a	370	7	0	377	9.6	71	11.8	
	Nelson Island	4,672 ^a	754	52	1	807	9.8	150	17.3	
	Nunivak Island	3,487	41	0	0	41	9.9	12	1.2	
	Cape Romanzof	3,500 ^a	313	187	0	500	9.1	77	14.3	
	Norton Sound	32,680	4,472	0	15	4,487	9.4	894 ^c	13.7	
Total		59,134	6,252	262	17	6,531	9.5	1,269	11.0	
1999	Security Cove	5,261	1,016	56	1	1,072	11.0	338	20.4	
	Goodnews Bay	6,896	1,332	33	0	1,366	11.3	301	19.8	
	Cape Avinof	3,555 ^a	516	18	0	533	11.0	185	15.0	
	Nelson Island	6,655	1,267	97	2	1,366	11.2	430	20.5	
	Nunivak Island ^b	3,319 ^a	-	-	-	-	-	-	-	
	Cape Romanzof	3,800 ^a	378	155	0	533	10.2	127	14.0	
	Norton Sound	34,314	2,702	53	5	2,760	10.5	615 ^c	8.0	
Total		63,800	7,211	412	8	7,630	10.9	1,996	12.0	
1998	Security Cove	4,017 ^a	1,012	0	0	1,012	11.5	232	25.2	
	Goodnews Bay	4,064 ^a	831	0	0	831	11.3	118	20.5	
	Cape Avinof	4,287 ^a	656	0	0	656	11.6	152	15.3	
	Nelson Island	7,136 ^a	1,250	0	0	1,250	11.8	296	17.5	
	Nunivak Island	3,778 ^a	202 ^d	0	0	202	9.8	26 ^e	5.4	
	Cape Romanzof	4,500 ^a	617	110	0	727	10.0	131	16.2	
	Norton Sound	52,033	2,624	8	0	2,632	9.2	203 ^c	5.1	
Total		79,815	7,192	118	0	7,310	10.2	1,158	9.2	
1997	Security Cove	4,640 ^a	884	3	5	892	12.5	221	19.2	
	Goodnews Bay	4,752 ^a	805	0	0	805	14.2	228	16.9	
	Cape Avinof	4,800 ^a	687	0	0	687	11.5	157	14.9	
	Nelson Island	7,900 ^a	778	0	0	778	12.7	198	9.8	
	Nunivak Island	3,801 ^a	0	0	0	0	-	-	0	
	Cape Romanzof	5,000 ^a	879	0	0	879	10.2	186	17.6	
	Norton Sound	47,791	3,709	263	5	3,976	9.9	612	8.3	
Total		78,484	7,742	266	10	8,017	11.1	1,602	10.2	
1996	Security Cove	6,867	1,795	59	5	1,859	11.6	1,251	27.1	
	Goodnews Bay	6,315	1,191	13	0	1,204	12.5	895	19.1	
	Cape Avinof	4,500 ^a	820	0	0	820	13.4	659	18.2	
	Nelson Island	6,638 ^a	986	44	0	1,030	11.4	679	15.5	
	Nunivak Island	4,195 ^a	61	40	0	101	9.9	39	2.4	
	Cape Romanzof	6,000 ^a	750	1	0	752	10.6	638	12.5	
	Norton Sound	27,307 ^a	6,061	109	50	6,220	10.6	4,569	22.8	
Total		61,822	11,664	266	55	11,986	11.2	8,730	19.4	
1995	Security Cove	6,702 ^a	1,292	0	0	1,292	12.3	956	19.3	
	Goodnews Bay	4,219 ^a	1,051	0	3	1,054	13.5	848	25.0	
	Cape Avinof	3,627 ^a	485	0	0	485	12.5	363	13.4	
	Nelson Island	7,754	1,113	0	0	1,113	10.6	710	14.3	
	Nunivak Island	4,579 ^a	33	7	0	41	11.0	22	0.9	
	Cape Romanzof	5,000 ^a	541	0	0	541	10.1	328	10.8	
	Norton Sound	37,779	6,647	116	10	6,773	10.4	4,206	17.9	
Total		69,660	11,162	123	13	11,299	11.0	7,433	16.2	
1994	Security Cove ^b	7,638 ^a	-	-	-	-	-	-	-	
	Goodnews Bay	5,679 ^a	1,061	0	1	1,062	12.3	391	18.7	
	Cape Avinof	2,827 ^a	427	0	0	427	12.2	156	15.1	
	Nelson Island	5,564	713	4	0	717	11.0	235	12.9	
	Nunivak Island	4,921	14	0	0	14	8.6	4	0.3	
	Cape Romanzof	5,000 ^a	456	0	0	456	9.2	124	9.1	
	Norton Sound	37,829	958	2	0	960	10.3	271	2.5	
Total		69,458	3,629	6	1	3,636	11.1	1,181	5.2	

^a Inseason biomass estimate from poor aerial survey, therefore projected biomass or some other method of estimating biomass was used.

^b No commercial fishery.

^c Includes values from sac-roe fishery only, does not include directed bait, or kelp fisheries values.

^d Includes 200 tons from the purse seine catch associated with an aerial survey calibration study.

^e Includes estimated value of \$25,000 for the purse seine catch associated with an aerial survey calibration study.

Table 3. Pacific herring harvests by commercial fishers during the sac roe fisheries in the northeastern Bering Sea, Alaska, 1909-2001.

Year	Herring (tons) ^a									Spawn on Kelp (tons)
	Security Cove	Goodnews Bay	Cape Avinof	Nelson Island	Nunivak Island	Cape Romanzof	Norton Sound	Port Clarence	Total Harvest	Norton Sound
1909-1916	-	-	-	-	-	-	^b	-	-	-
1916-1928	-	-	-	-	-	-	1,881	-	1,881	-
1929	-	-	-	-	-	-	166	-	166	-
1930	-	-	-	-	-	-	441	-	441	-
1931	-	-	-	-	-	-	86	-	86	-
1932	-	-	-	-	-	-	529	-	529	-
1933	-	-	-	-	-	-	31	-	31	-
1934	-	-	-	-	-	-	4	-	4	-
1935	-	-	-	-	-	-	15	-	15	-
1936	-	-	-	-	-	-	-	-	-	-
1937	-	-	-	-	-	-	6	-	6	-
1938	-	-	-	-	-	-	10	-	10	-
1939	-	-	-	-	-	-	6	-	6	-
1940	-	-	-	-	-	-	14	-	14	-
1941	-	-	-	-	-	-	3	-	3	-
1942-1944	-	-	-	-	-	-	-	-	-	-
1945	-	-	-	-	-	-	-	-	-	-
1946	-	-	-	-	-	-	-	-	-	-
1947-1963	-	-	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	20	-	20	-
1965	-	-	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	12	-	12	-
1967	-	-	-	-	-	-	-	-	-	-
1968	-	-	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	2	-	2	-
1970	-	-	-	-	-	-	8	-	8	-
1971	-	-	-	-	-	-	20	-	20	-
1972	-	-	-	-	-	-	17	-	17	-
1973	-	-	-	-	-	-	35	-	35	-
1974	-	-	-	-	-	-	2	-	2	-
1975	-	-	-	-	-	-	-	-	-	-
1976	-	-	-	-	-	-	9	-	9	-
1977	-	-	-	-	-	-	11	-	11	<1
1978	286	-	-	-	-	-	15	-	301	4
1979	424	90	-	-	-	-	1,292	-	1,806	13
1980	697	448	-	-	-	611	2,452	-	4,208	24
1981	1,173	657	-	-	-	720	4,371	-	6,921	47
1982	813	486	-	-	-	657	3,933	-	5,889	38
1983	1,073	435	-	-	-	816	4,582	-	6,906	29
1984	335	717	-	-	-	1,185	3,662	-	5,899	19 ^c
1985	733	724	-	977	358	1,299	3,548	-	7,639	-
1986	751	557	-	886	511	1,865	5,194	-	9,764	-
1987	313	321	-	923	414	1,342	4,082	146	7,541	-
1988	324	483	348	775	-	1,119	4,672	80	7,801	-
1989	554	616	129	233	116	926	4,771	-	7,345	-
1990	234	455	50	-	-	329	6,439	-	7,507	-
1991	570	263	267	-	59	526	5,672	-	7,357	-
1992	834	740	451	246	27	530	-	-	2,828	-
1993	5	954	215	739	-	371	5,079	-	7,363	-
1994	-	1,062	427	717	14	456	960	-	3,636	-
1995	1,292	1,054	485	1,113	41	541	6,773	-	11,289	-
1996	1,859	1,204	820	1,030	101	752	6,220	-	11,986	-
1997	892	805	687	778	0	879	3,976	-	8,017	-
1998	1,012	831	656	1,250	202 ^d	727	2,632 ^e	-	7,310	9 ^f
1999	1,072	1,366	533	1,366	-	533	2,760 ^g	-	7,630	4
2000	299	20	377	807	41	500	4,487	-	6,531	2
2001	1,024	45	231	678	-	137	2,245	-	4,360	2

^a Pre-1964 harvest primarily in the summer and fall for food; post-1964 harvest primarily the in spring for sac roe. Waste is included.

^b Fishery occurred some years but harvest data is unavailable.

^c Additional 3 tons harvested from imported kelp (*Macrocystis* sp.) not included.

^d Includes 200 tons harvested with purse seine during an aerial survey calibration study.

^e Includes 8.3 tons harvested during a directed bait fishery.

^f Includes 2,100 lbs of wild kelp and 16,083 lbs of *Macrocystis* kelp.

^g Includes 8.3 tons harvested during a directed bait fishery.

Table 4. Number of buyers and fishers participating in northeastern Bering Sea Pacific herring fisheries, Alaska, 1994-2001.

Year	District	Number of Buyers	Number of Fishermen		
			Gillnet	Seine ^a	Totals
2001	Security Cove	6	56	-	-
	Goodnews Bay	1	23	-	-
	Cape Avinof	1	45	-	-
	Nelson Island	1	49	-	-
	Nunivak Island	0	0	0	-
	Cape Romanzof	1	24	-	-
	Norton Sound	3	73	0	76 ^b
2000	Security Cove	10	79	-	-
	Goodnews Bay	2	57	-	-
	Cape Avinof	1	86	-	-
	Nelson Island	4	86	-	-
	Nunivak Island	1	0	35	-
	Cape Romanzof	2	46	-	-
	Norton Sound	4	91	3	97 ^c
1999	Security Cove	8	87	-	-
	Goodnews Bay	5	94	-	-
	Cape Avinof	3	117	-	-
	Nelson Island	4	94	-	-
	Nunivak Island	0	0	-	-
	Cape Romanzof	1	57	-	-
	Norton Sound	4	119	0	122 ^d
1998	Security Cove	9	78	-	-
	Goodnews Bay	2	84	-	-
	Cape Avinof	2	109	-	-
	Nelson Island	2	86	-	-
	Nunivak Island	1	7	1	8 ^e
	Cape Romanzof	1	41	-	-
	Norton Sound	2	35	0	47 ^f
1997	Security Cove	14	222	-	-
	Goodnews Bay	3	139	-	-
	Cape Avinof	2	145	-	-
	Nelson Island	3	105	-	-
	Nunivak Island	1	12	-	-
	Cape Romanzof	3	65	-	-
	Norton Sound	9	214	6	220
1996	Security Cove	14	326	-	-
	Goodnews Bay	5	182	-	-
	Cape Avinof	2	161	-	-
	Nelson Island	3	109	-	-
	Nunivak Island	2	24	-	-
	Cape Romanzof	3	63	-	-
	Norton Sound	10	281	6	287
1995	Security Cove	12	106	-	-
	Goodnews Bay	4	127	-	-
	Cape Avinof	2	93	-	-
	Nelson Island	4	100	-	-
	Nunivak Island	2	13	-	-
	Cape Romanzof	2	49	-	-
	Norton Sound	6	209	6	215
1994	Security Cove	0	0	-	-
	Goodnews Bay	2	103	-	-
	Cape Avinof	1	85	-	-
	Nelson Island	3	104	-	-
	Nunivak Island	1	12	-	-
	Cape Romanzof	2	55	-	-
	Norton Sound	7	212	3	215

^a Beach seine gear prohibited in all districts except Norton Sound and Port Clarence. Purse seine gear allowed only in the Nunivak Island District.

^b Includes 73 gillnet fishers and 3 kelp fishers.

^c Includes 91 gillnet fishers, 3 beach seine fishers and 3 kelp fishers.

^d Includes 119 gillnet fishers, 1 bait fisher and 2 kelp fishers.

^e Includes 7 gillnet fishers and 1 purse seine fisher.

^f Includes 35 gillnet fishers, 1 bait fisher and 11 kelp fishers.

Table 5. Projections of Pacific herring spawning biomass and harvest guideline for commercial fishing districts in the northeastern Bering Sea, Alaska, 2002.

District	Threshold	Projected ^a Biomass (tons)	Exploitation Rate (%)	Harvest (tons) ^a Guideline
Security Cove	1,200	4,487	20	897
Goodnews Bay	1,200	5,529	20	1,106
Cape Avinof	500	3,491	15	524
Nelson Island	3,000	5,296	16	859 ^b
Nunivak Island	1,500	5,422	20	1,084
Cape Romanzof	1,500	2,284 ^c	20	457 ^c
Norton Sound	7,000	22,463	20	4,493
Port Clarence	-	-	-	165 ^d
Totals		48,972		9,585

^a Preseason projection. Biomass and harvest may be adjusted based on inseason estimates.

^b Nelson Island commercial harvest is 20% of projected biomass minus 200 tons for subsistence harvest.

^c Projection from midpoint of 2001 biomass estimate of 2,400 to 3,000 tons. Allowable harvest will range from 403 to 510 tons based on inseason indicators of abundance.

^d Harvest guideline of 165 tons.

Table 6. Pacific herring subsistence harvest (tons) and effort data from selected northeastern Bering Sea areas, Alaska, 1978-2001.^a

Village	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
<u>Nelson Island</u>																								
Tununak	38	34	65	40	48	94	-	43	63	48 ^c	49 ^c	47 ^c	54 ^c	21 ^c	32 ^c	45	42	30	26	-	-	-	-	-
Umkumiut	11	8	3	10	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toksook Bay	37	51	29	14	35	-	-	46	70	51	58	52	46	40	43	23	53	46	42	-	-	-	-	-
Nightmute	-	-	-	-	-	-	-	3 ^b	21	15	16	15	18	8	10	9	13	13	16	-	-	-	-	-
Newtok	-	-	-	-	-	-	-	7 ^b	13	10	12	10	8	1	7	6	9	9	12	-	-	-	-	-
Total	86	93	97	64	83	94	-	99	167	124	136	124	126	70	92	82	117	98	95	-	-	-	-	-
No. Fishing Families	83	54	70	93	65	43	-	65 ^b	72 ^b	96	104	^b	100	85	97	89	-	91	96	-	-	-	-	-
<u>Nunivak Island</u>																								
Mekoryuk	-	-	-	-	-	-	-	<1	<1	-	-	-	5	4	4	2	-	-	-	-	-	-	-	-
No. Fishing Families	-	-	-	-	-	-	-	11	6 ^b	-	-	-	19	20	17	16	-	-	-	-	-	-	-	-
<u>Other Kuskokwim Delta</u>																								
Chefornak	-	-	-	-	-	-	-	13 ^b	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kipnuk	-	-	-	-	-	-	-	9	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kongiganak	-	-	-	-	-	-	-	3	2 ^b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kwigillingok	-	8	13	-	13	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	8	13	-	13	-	-	30	2	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
No. Fishing Families	-	22	19	-	21	-	-	55 ^b	12 ^b	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>Yukon Delta</u>																								
Scammon Bay	1	6	3	8	4	3	4	2	2	1	2	1	2	1	1	3	1	1	1	1	<1	6	4	2
Chevak	-	2	4	2	2	1	3	2	1	1	2	<1	1	<1	<1	<1	2	1	<1	<1	<1	2	1	1
Hooper Bay	4	3	4	4	5	5	4	4	4	1	4	2	6	2	2	2	3	4	2	2	1	4	1	<1
Total	5	11	11	14	11	9	11	8	6	3	7	3	8	3	4	5	6	6	3	3	2	13	6	3
No. Fishing Families	30	84	61	45	43	37	47	44	40	23	32	24	32	18	30	42	48	42	29	34	15	67	50	23

^a Subsistence survey results are believed to accurately reflect harvest trends, however, reported catches reflect minimum figures since all fishermen cannot be contacted.

^b Fishing families were not interviewed or only a portion of fishing families were interviewed as harvest was enumerated while on drying racks.

^c Umkumiut effort was included with Tununak.

Table 7. Summary of Pacific herring commercial harvest by fishing period for northeastern Bering Sea fishing districts, Alaska, 2001.

District	Subdistrict Sec/Area	Gear	Period	Date	Time	Total Hours	Harvest (tons)	
Security Cove		Gillnet	1	5/17	0030-0230	2.0	88.7	
			2	5/17	1430-2030	6.0	293.7	
			3	5/18	1600-2200	6.0	379.6	
			4	5/19	1630-2000	3.5	262.5	
			Total					17.5
Goodnews Bay		Gillnet	1	5/21	1700-2200	5.0	15.0	
			2	5/22	0500-1000	5.0	11.2	
			3	5/22	1700-2300	6.0	19.2	
Total					16.0	45.3		
Cape Avinof		Gillnet	1	6/4	0800-1300	5.0	12.1	
			2	6/4-5	2000-0200	6.0	64.4	
			3	6/5	0900-1500	6.0	18.1	
			4	6/5-6	2100-0300	6.0	2.5	
			5	6/6	0900-1500	8.0	24.1	
			6	6/6-7	2100-0500	8.0	20.2	
			7	6/7	1000-1800	8.0	1.5	
			8	6/7-8	2200-0600	8.0	42.1	
			9	6/8	1100-1900	8.0	46.0	
Total					63.0	231.0		
Nelson Island		Gillnet	1	5/29	0630-0830	2.0	0.0	
			2	5/29	1630-2030	4.0	4.2	
			3	5/30	1400-2000	6.0	177.6	
			4	5/31	1700-2300	6.0	253.2	
			5	6/1	1630-2000	3.5	197.2	
			6	6/8	0000-0500	5.0	46.1	
Total					26.5	678.3		
Nunivak Island		No Commercial Fishery						
Cape Romanzof		Gillnet	1	6/4-5	2200-0300	5.0	26.6	
			2	6/6	0130-0400	2.5	5.1	
			3	6/6	1400-1600	2.0	7.2	
			4	6/7	0000-0400	4.0	98.2	
Total					13.5	137.1		
Norton Sound	2, 3	Gillnet	1	6/12	1100-1900	8.0	838.1	
			1	2	6/13-14	1330-0130	12.0	174.3
			1, 2, 3	3	6/14-15	1000-0200	16.0	494.0
			1, 2, 3	4	6/15-16	1000-0200	16.0	440.6
			1, 2, 3	5	6/16	1000-2200	12.0	298.0
			1, 2, 3	6	6/18	1200-2000	8.0	0.0
			1, 3	7	6/19	0000-1200	12.0	0.0
	Total					84.0	2,245.0	
	1,2,3,4,5,6	Open Pound	1	6/12-21	continuous		2.2 ^a	

^a Product weight

Table 8. Herring harvest by gear type and subdistrict, Norton Sound District, 1982-2001.

NORTON SOUND HERRING CATCHES																				
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
GILLNET HARVEST (tons)																				
St. Michael	2,062	434	-	1,538	2,560	2,214	3,215	2,927	4,491	-	-	2,288	249	2,359	3,074	1,575	1,543	285	2,623	898
Unalakleet	946	1,264	-	95	-	-	42	10	618	731	-	120	12	374	-	20	-	324	-	-
Cape Denbigh	925	2,692	3,244	1,599	2,420	1,545	1,211	1,414	923	4,419	-	1,659	619	1,467	2,507	1,864	1,081	2,138	1,767	1,347
Elim	-	65	-	147	-	-	6	-	-	-	-	225	41	1,774	-	-	-	-	-	-
Golovin	-	85	-	-	-	-	-	-	-	-	-	-	-	191	-	-	-	-	-	-
Nome	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-
Total ^a	3,933	4,540	3,244	3,379	4,980	3,759	4,474	4,351	6,032	5,150	^b	4,291	921	6,166	5,581	3,459	2,632	2,755	4,390	2,245
SEINE HARVEST (tons)																				
St. Michael (beach)	-	-	-	-	-	4	45	329	6	-	-	-	1	-	-	472	-	-	-	-
Unalakleet (beach)	-	-	-	93	-	-	58	50	332	149	-	467	24	230	111	41	-	-	81	-
Cape Denbigh (beach)	-	41	327	76	30	293	96	11	9	373	-	222	15	57	325	-	-	-	-	-
Elim (beach)	-	-	-	-	185	-	-	-	-	-	-	54	-	334	153	-	-	-	-	-
Cape Denbigh (purse)	-	-	-	-	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total ^a	0	41	327	169	215	323	198	390	347	522	^b	743	40	621	589	513	0	0	81	0
TOTAL HARVEST (tons) ^a	3,933	4,581	3,571	3,548	5,195	4,082	4,672	4,741	6,380	5,672	^b	5,034	961	6,787	6,170	3,972	2,632	2,755	4,472	2,245
Percent of total harvest																				
Gillnet Harvest	100	99.1	90.8	95.2	95.9	92.1	95.8	91.8	94.6	90.8	-	85.2	95.9	90.9	90.5	87.1	100	100	98.2	100
Seine Harvest	0	0.9	9.2	4.8	4.1	7.9	4.2	8.2	5.4	9.2	-	14.8	4.1	9.1	9.5	12.9	0	0	1.8	0

^a Totals do not include waste.

^b No commercial fishery.

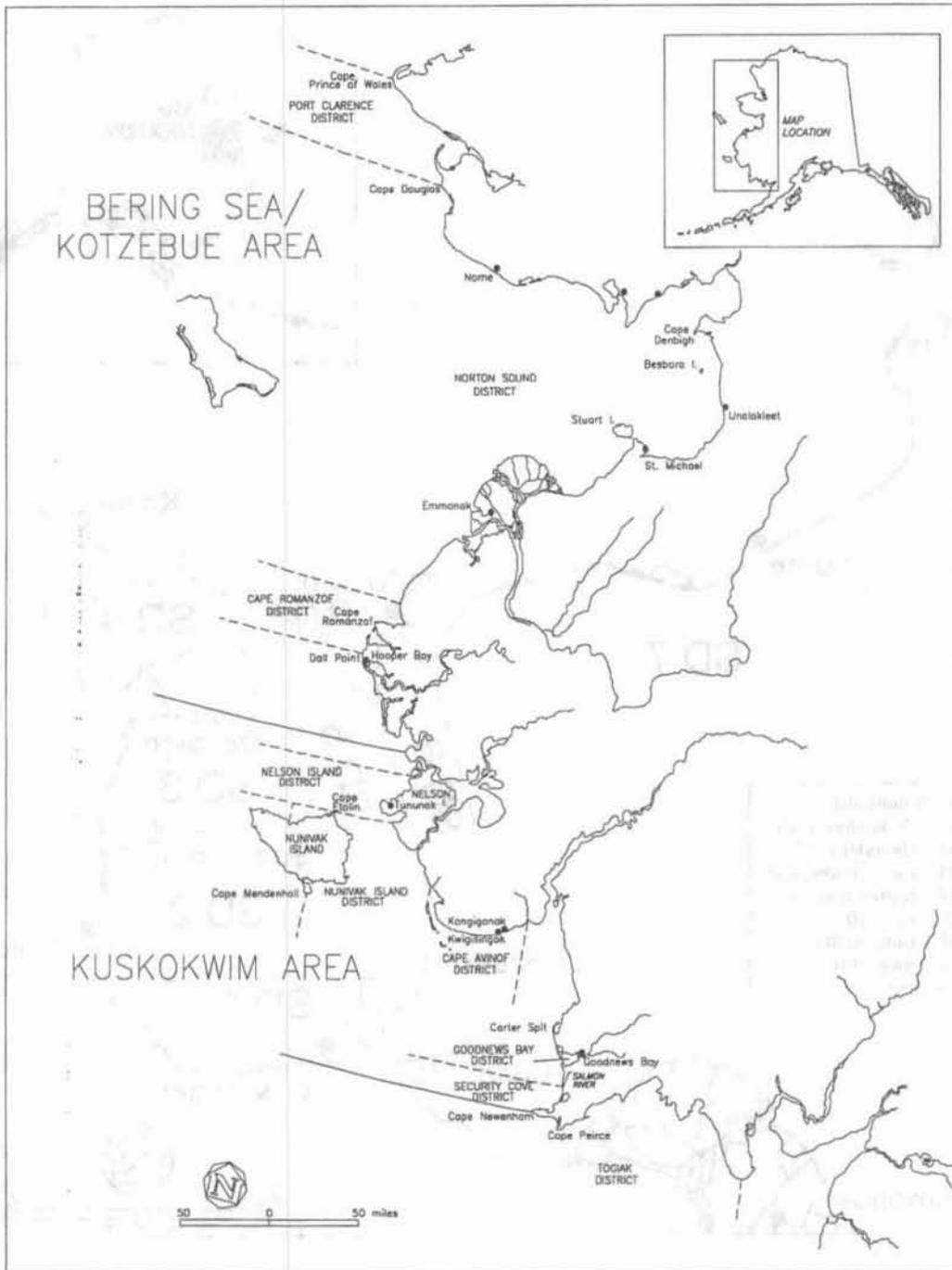


Figure 1. Commercial herring fishing districts within the Arctic-Yukon -Kuskokwim Region of the northeastern Bering Sea, Alaska.

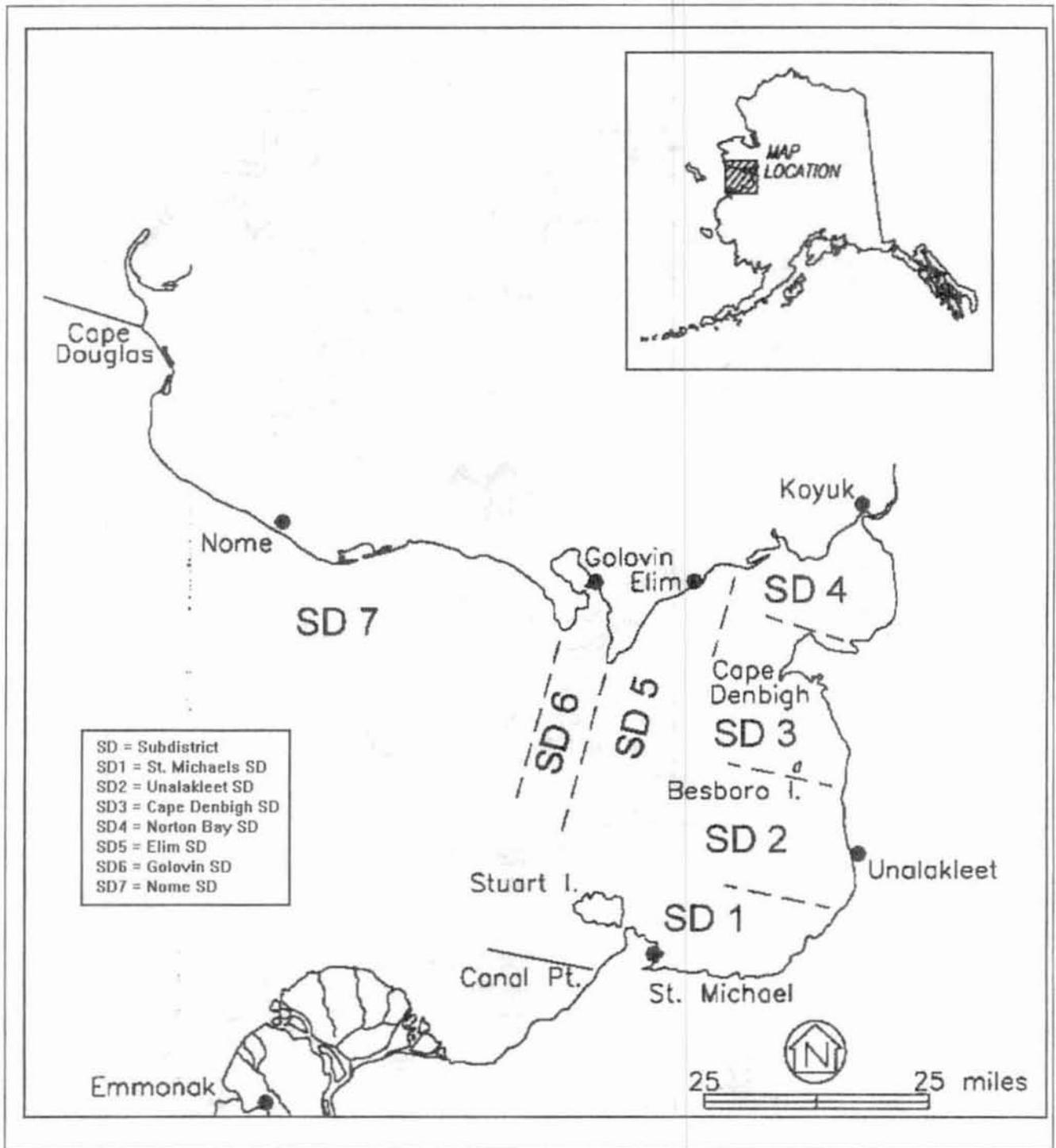


Figure 2. Norton Sound commercial herring subdistricts.

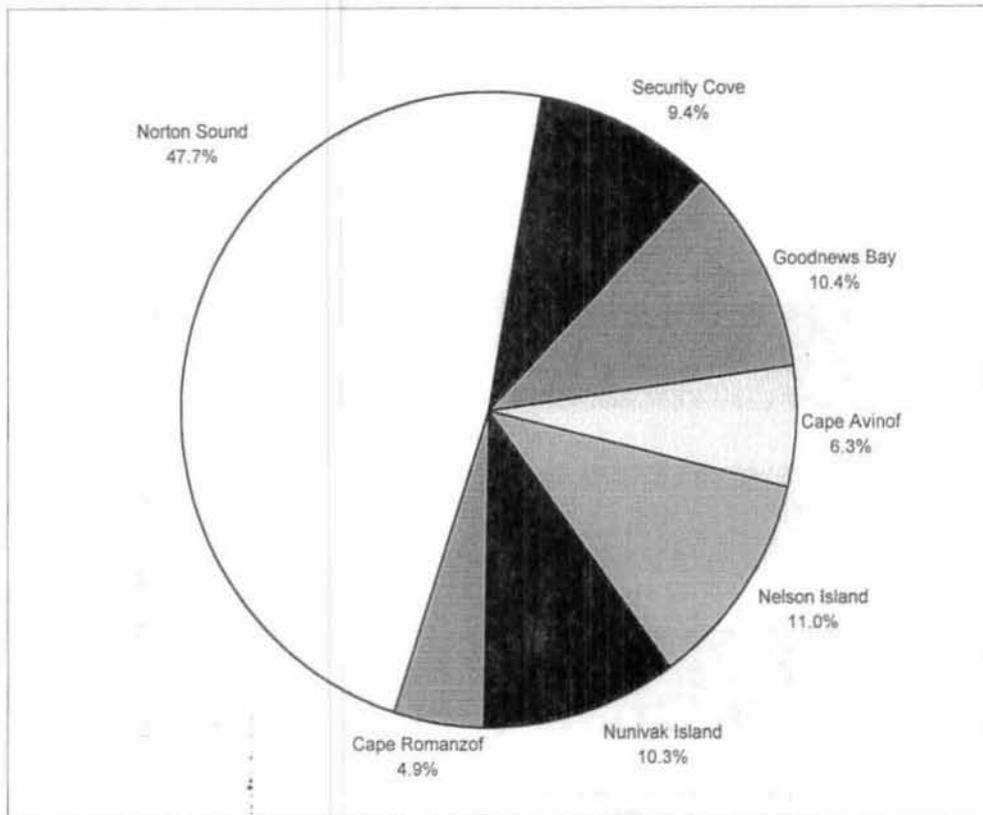


Figure 3. Pacific herring run biomass distribution by commercial fishing district, Arctic-Yukon-Kuskokwim Region, Alaska, 2001.

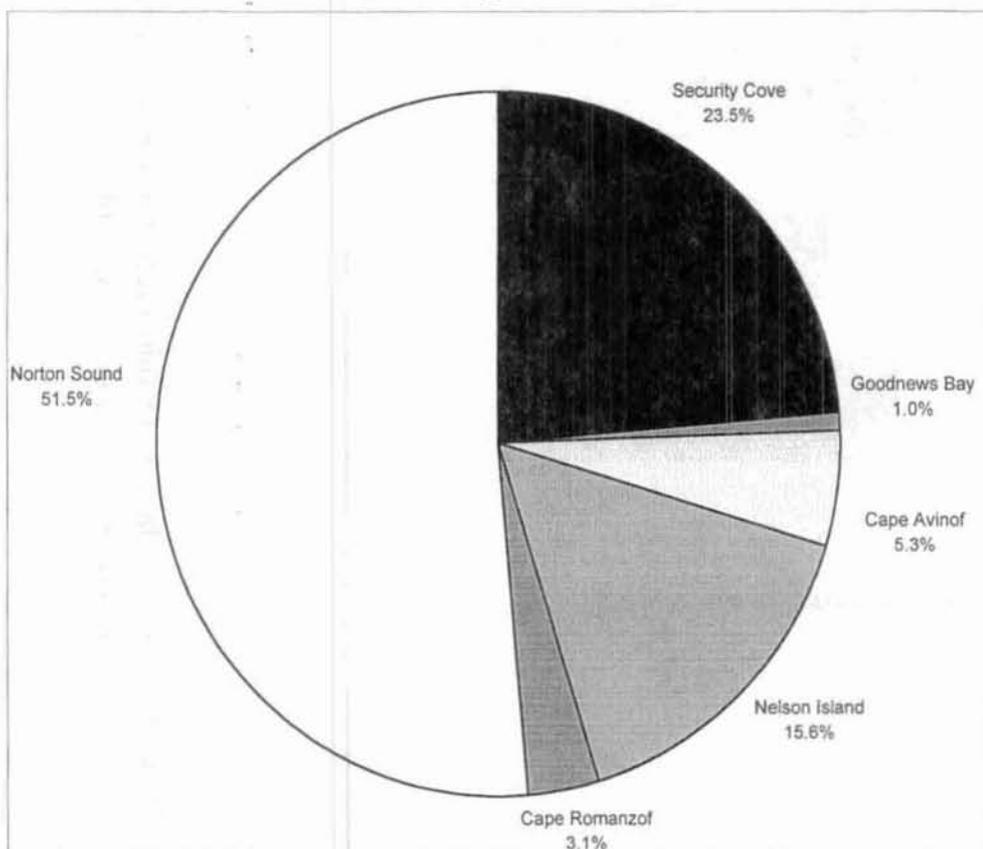


Figure 4. Pacific herring commercial harvest distribution by fishing district, Arctic-Yukon-Kuskokwim Region, Alaska, 2001.

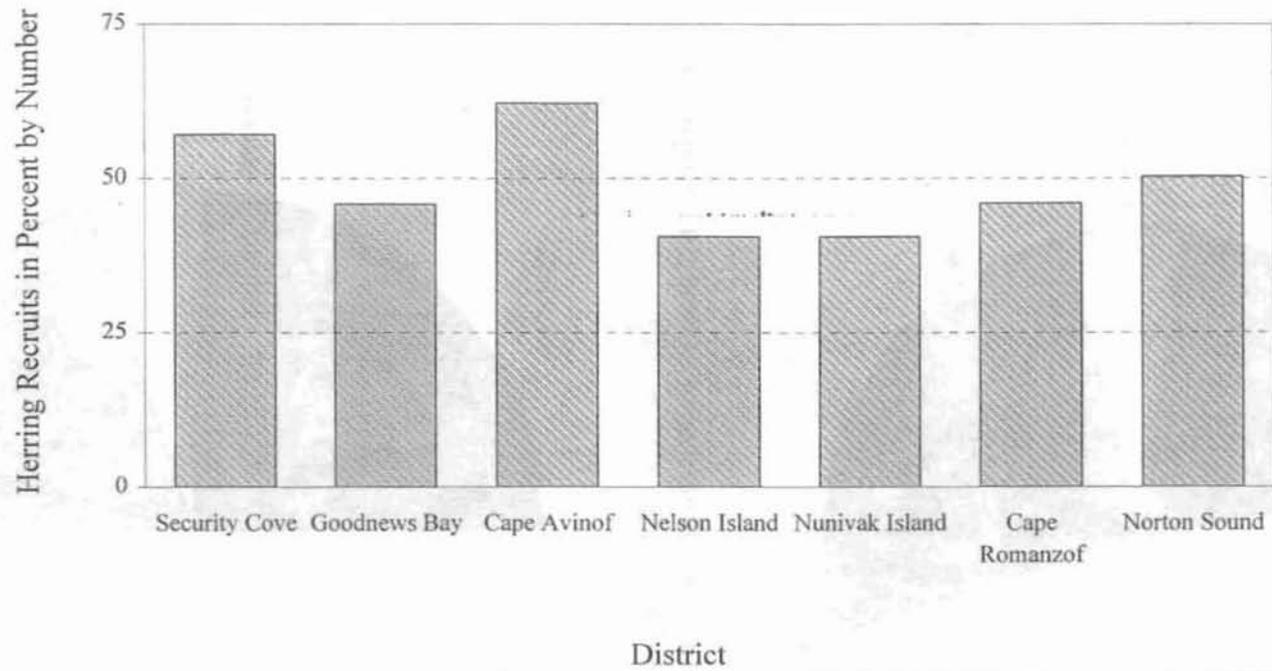


Figure 5. Pacific herring recruits (ages 2 through 5) for commercial fishing districts within the Arctic-Yukon Kuskokwim Region, Alaska, 2001.

Total Run Biomass (tons)

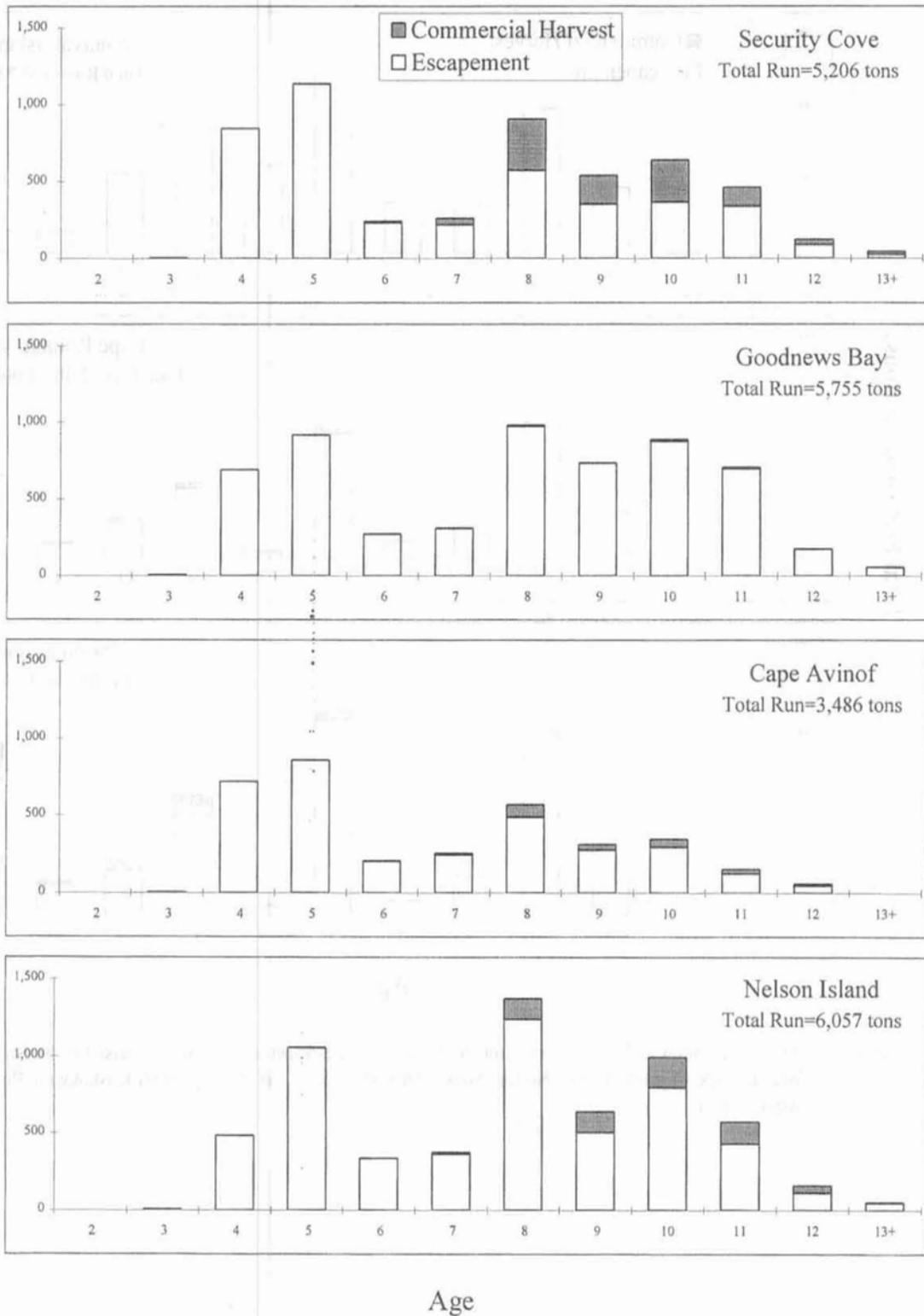


Figure 6. Age composition of Pacific herring for the total run, escapement and harvest biomass for the Security Cove, Goodnews Bay, Cape Avinof, and Nelson Island Districts within the Arctic-Yukon-Kuskokwim Region, Alaska, 2001.

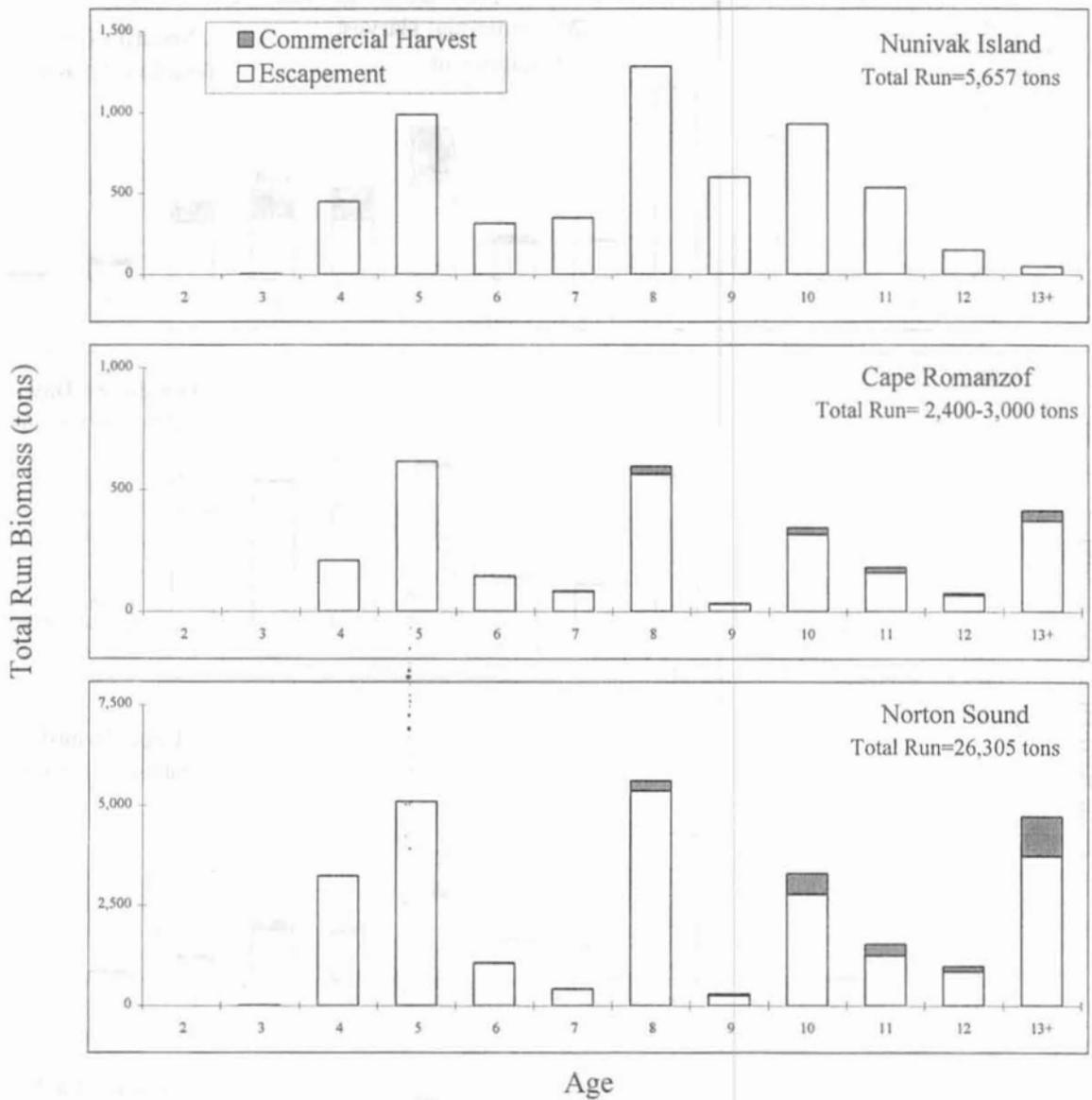


Figure 7. Age composition of Pacific herring for the total run, escapement and harvest biomass for the Nunivak Island, Cape Romanzof, and Norton Sound Districts within the Arctic-Yukon-Kuskokwim Region, Alaska, 2001.