

ALASKA PENINSULA AND ALEUTIAN ISLANDS MANAGEMENT
AREAS SAC ROE HERRING REPORT AND THE ALASKA PENINSULA
MANAGEMENT AREA FOOD AND BAIT HERRING REPORT, 1991

By

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and

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ABSTRACT

By regulation, the 1991 herring sac roe season extends from April 15 through July 15 in the Alaska Peninsula and Aleutian Islands waters and the Alaska Peninsula herring food and bait season extends from August 15 through February 28. However, the opening of the Unimak, Akutan, Unalaska, Umnak, and Adak Districts occurred from April 15 through June 15; the Port Moller District was opened from May 17 through June 30; the Amak and Port Heiden Districts was open from April 15 through June 30; and the Sand Point, Pavlof, and King Cove Districts were opened from April 15 through July 15. During the herring food and bait season the Port Heiden, Port Moller, and Amak Districts were closed for the season; the King Cove District was open from August 15 through August 20; and the Pavlof and Sand Point Districts were open from August 15 through February 28.

In 1991, commercial sac roe catches occurred in North Peninsula waters from May 17 through July 4 and in South Peninsula waters from May 16 to June 11. No sac roe harvest occurred in the Aleutian Islands Management Area. The North Peninsula catch was 1,313.0 tons and the South Peninsula catch was 157.4 tons, producing a total Alaska Peninsula catch of 1,470.5 tons. The 1991 catch was 71% above the recent five year average of 862.4 tons. Eighteen purse seine permit holders made 85 deliveries to two companies that purchased herring. The average roe recovery (not counting herring purchased as bait during the sac roe season) was 9.12% for the North Peninsula, 9.66% for the South Peninsula, and overall was 9.19%. The average price per ton was \$400 for 10% roe recovery and \pm \$50 for each percentage point above or below 10%, giving an sac roe ex-vessel value of about \$439,244 for the Alaska Peninsula sac roe fishery. During the sac roe season, 307.3 tons of herring were purchased in the Port Moller District as bait herring. When caught, the herring had a roe percentage of about 10%. These herring had been feeding and the fish became "belly burned" and unmarketable within 21 hours after being caught. The "belly burned" herring (307.2 tons) were purchased at \$50 per ton.

A total biomass estimate for the North Peninsula was not possible due to budget constraints. The last herring survey was flown on June 7. Fishermen reported herring entering the Port Moller District as late as mid July. The minimum herring biomass in the Port Moller District was estimated at 8,400 tons. A total biomass estimate for the South Peninsula was not possible; herring are believed to have arrived late in the season when department staff were working on salmon projects, or during periods of poor survey conditions.

In 1991, commercial food and bait catches occurred in South Peninsula waters from August 18 through August 19. The North Peninsula food and bait season was closed because of the 16% exploitation rate of Port Moller District stocks during the sac roe season and the unknown origin of herring stocks in North Peninsula coastal waters during the food and bait season. The South Peninsula catch of 161.4 tons was harvested from the King Cove District. The 1991 catch was the first since 1982, when 565 tons were harvested. Two purse seine permit holders made four deliveries to one company that purchased herring. The average price per ton was \$300 giving a food and bait ex-vessel value of about \$48,420 for the Alaska Peninsula food and bait fishery.

KEY WORDS: Alaska Peninsula, Aleutian Islands, herring, catch, age, length, weight, sex

INTRODUCTION

The Alaska Peninsula and Aleutian Islands Management Areas (Figure 1) are described as Management Area "M" and are divided into three subareas; (1) the South Peninsula, consisting of Pacific Ocean coastal waters extending west of Kupreanof Point to 163°30' W. long. on Unimak Island; (2) the Aleutian Islands, consisting of Bering Sea waters extending west of Unimak Pass to the international dateline and Pacific Ocean waters extending west from 163°30' W. long. on Unimak Island to the international dateline; and (3) the North Peninsula, consisting of Bering Sea waters extending west from Cape Menshikof to Cape Sarichef (Figures 2-6).

The North Peninsula is comprised of three districts and 23 statistical areas, the South Peninsula is comprised of three districts and 45 statistical areas, and the Aleutian Islands is comprised of five districts and 41 statistical areas. Commercial herring fishing normally begins about the last week of May in North Peninsula waters and about mid-May in South Peninsula waters. The Aleutian Islands have had no reported sac roe harvest since at least 1979.

Commercial herring fisheries have been regulated by emergency order to achieve exploitation mandates by the Board of Fisheries and address problems with wastage. A management plan (McCullough 1991) and other directives from the board set policies by which these fisheries are allowed to operate.

Pacific herring (*Clupea pallasii*) have been reported throughout the South Peninsula and most areas in the North Peninsula. The major concentration of herring and fishing effort in the North Peninsula occurs in the Bear River, Port Moller Bay, and Herendeen Bay Sections, while most of the known herring stocks and fishing effort in South Peninsula waters occurs in the Shumagin Islands Stepovak Bay Section, Pavlof Bay, and Canoe Bay Section.

From 1981 through 1991, the Alaska Department of Fish and Game (ADF&G) has deployed field crews in the Alaska Peninsula for the purpose of collecting data and to monitor the fishery. Crews have been successful in collecting samples and documenting spawning areas and substrate. Aerial surveys have been used with limited success to monitor the fishery, primarily due to the large area involved, weather, water conditions, and the sporadic and currently unpredictable appearance of the herring. In the ten years that the ADF&G has been conducting aerial surveys in the Alaska Peninsula, only surveys flown in 1989 and 1991 are thought to have provided an accurate assessment of the total spawning biomass in the Port Moller District.

Aerial surveys of the Port Moller area by Alaska Department of Fish and Game (ADF&G) personnel in 1976 reported numerous schools of herring in Herendeen Bay (Warner and Shafford 1979). The first commercial catches of sac roe herring in North Peninsula waters occurred in 1982 when 513.5 tons were harvested (Table 1). From 1985-90, an average of 542.5 tons have been harvested in the sac roe fishery. The majority (61.6%) of the harvest was taken from Herendeen and Moller Bays, while the remaining balance of the catch (38.4%) was taken off the Bering Sea coast between Entrance Point and the Seal Islands (Table 2). Prior to 1982, fishing vessels destined to or returning from the Togiak herring fishery frequently looked for herring in the Port Moller area but made no deliveries. Since 1982, a commercial sac roe fishery has developed in both Port Moller and

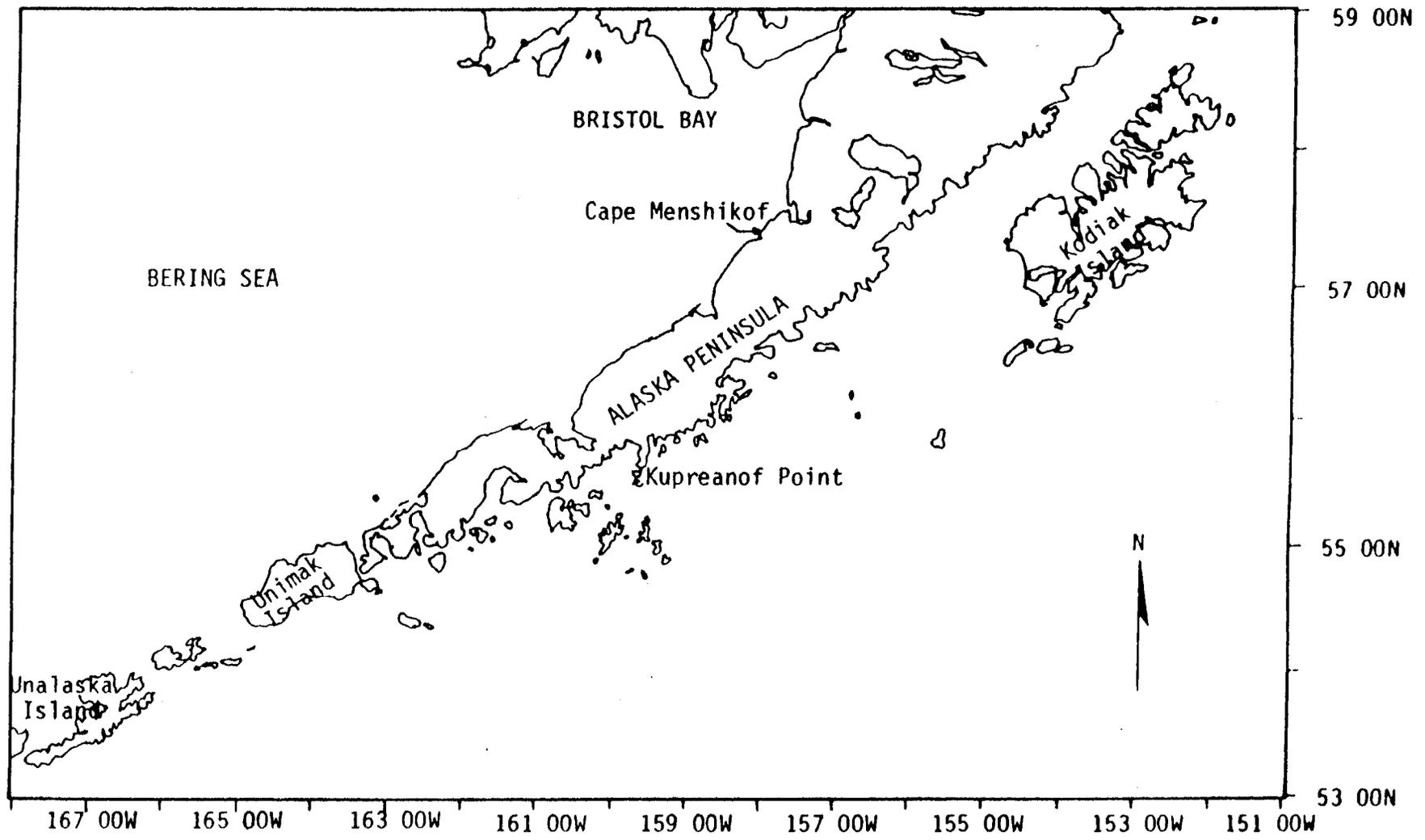


Figure 1. Map of the Alaska Peninsula and Eastern Aleutian Islands Management Areas, the study area on the Pacific Ocean portion of the map is from Kupreanof Point to Unalaska Island and on the Bering Sea from Unalaska Island to Cape Menchikof.

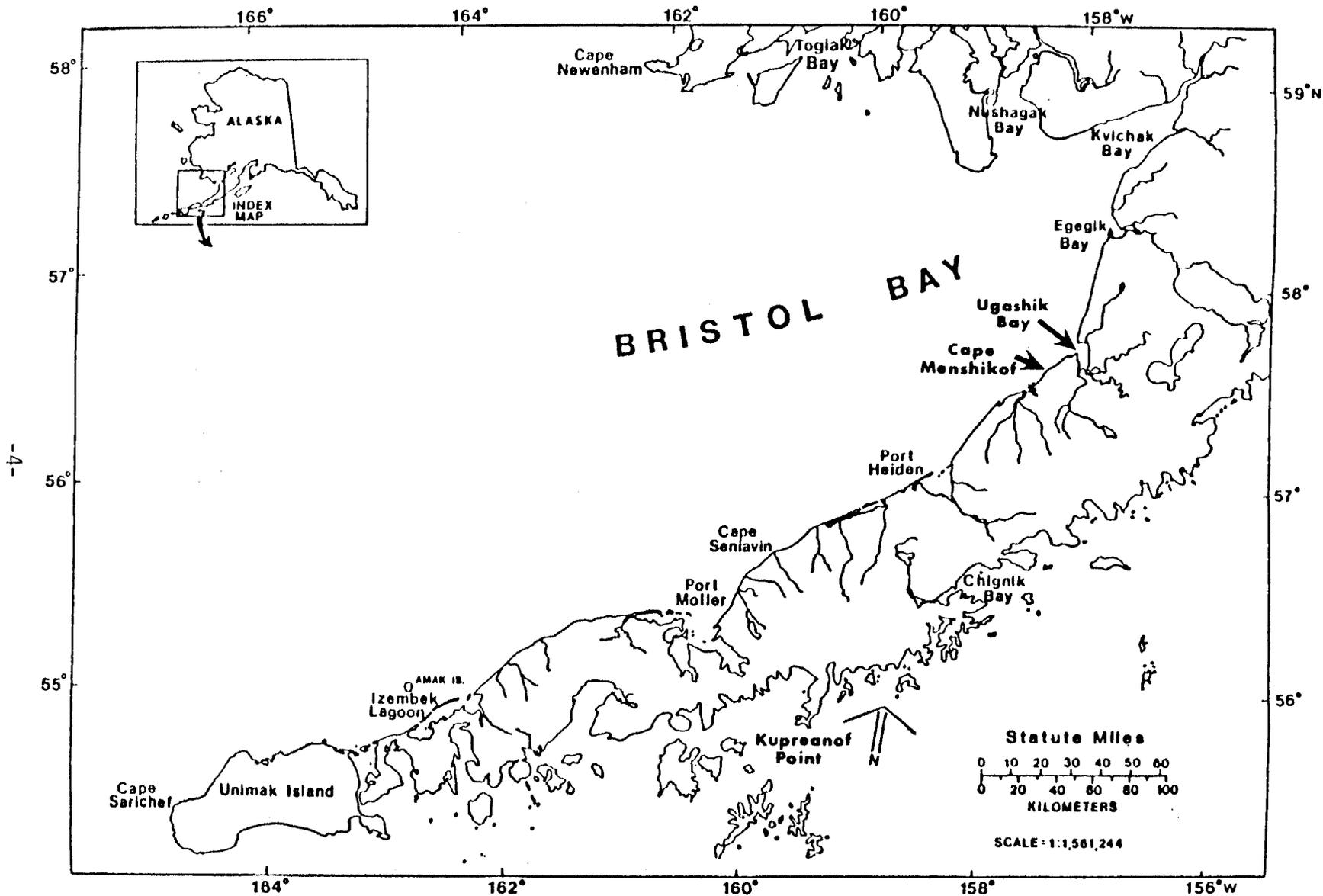


Figure 2. Map of the Alaska Peninsula Area from Kvichak Bay to Unimak Island.

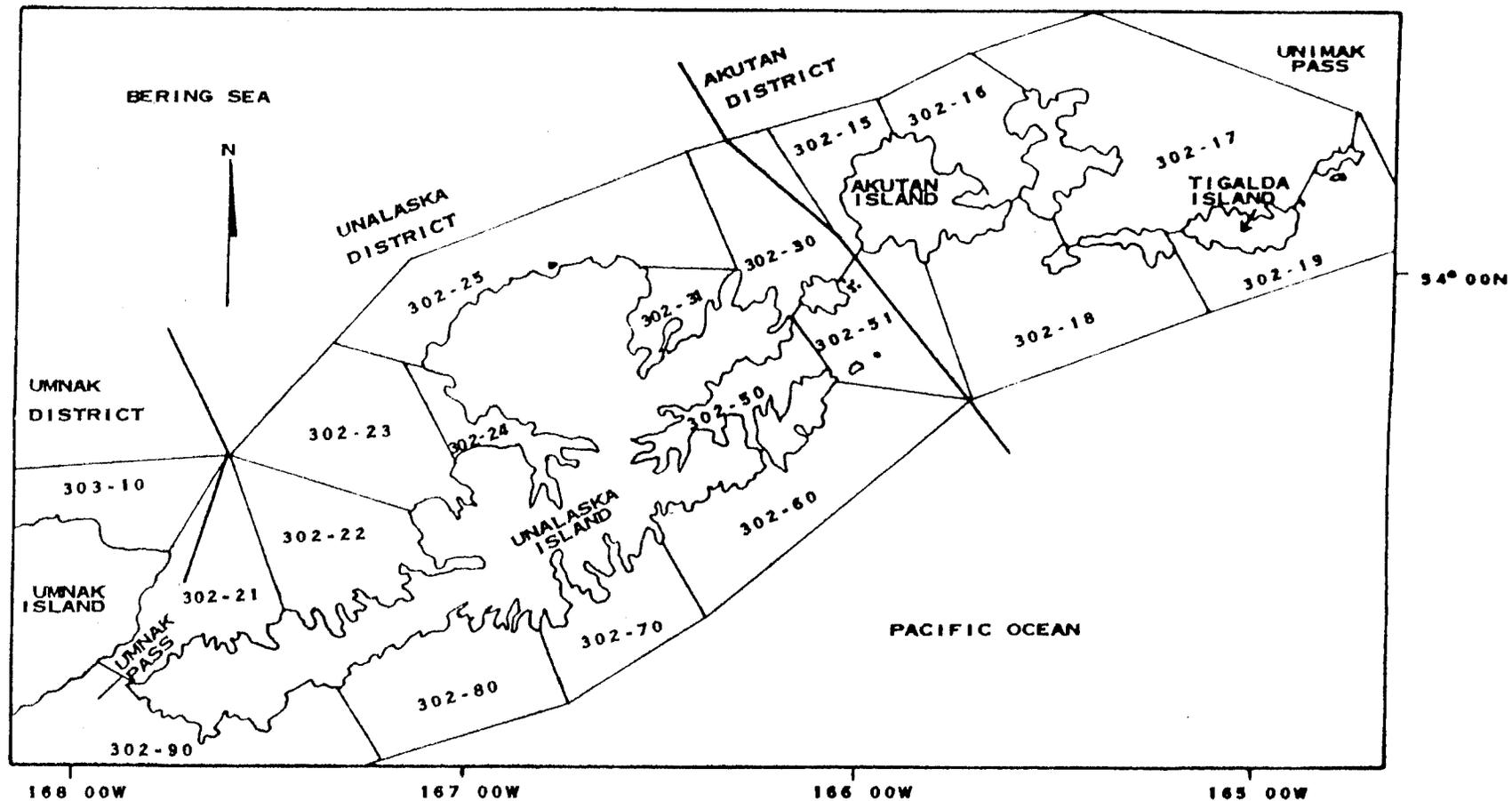


Figure 3. Map of the Aleutian Islands Area from Unmak Pass to Unimak Pass with the statistical herring fishing areas shown.

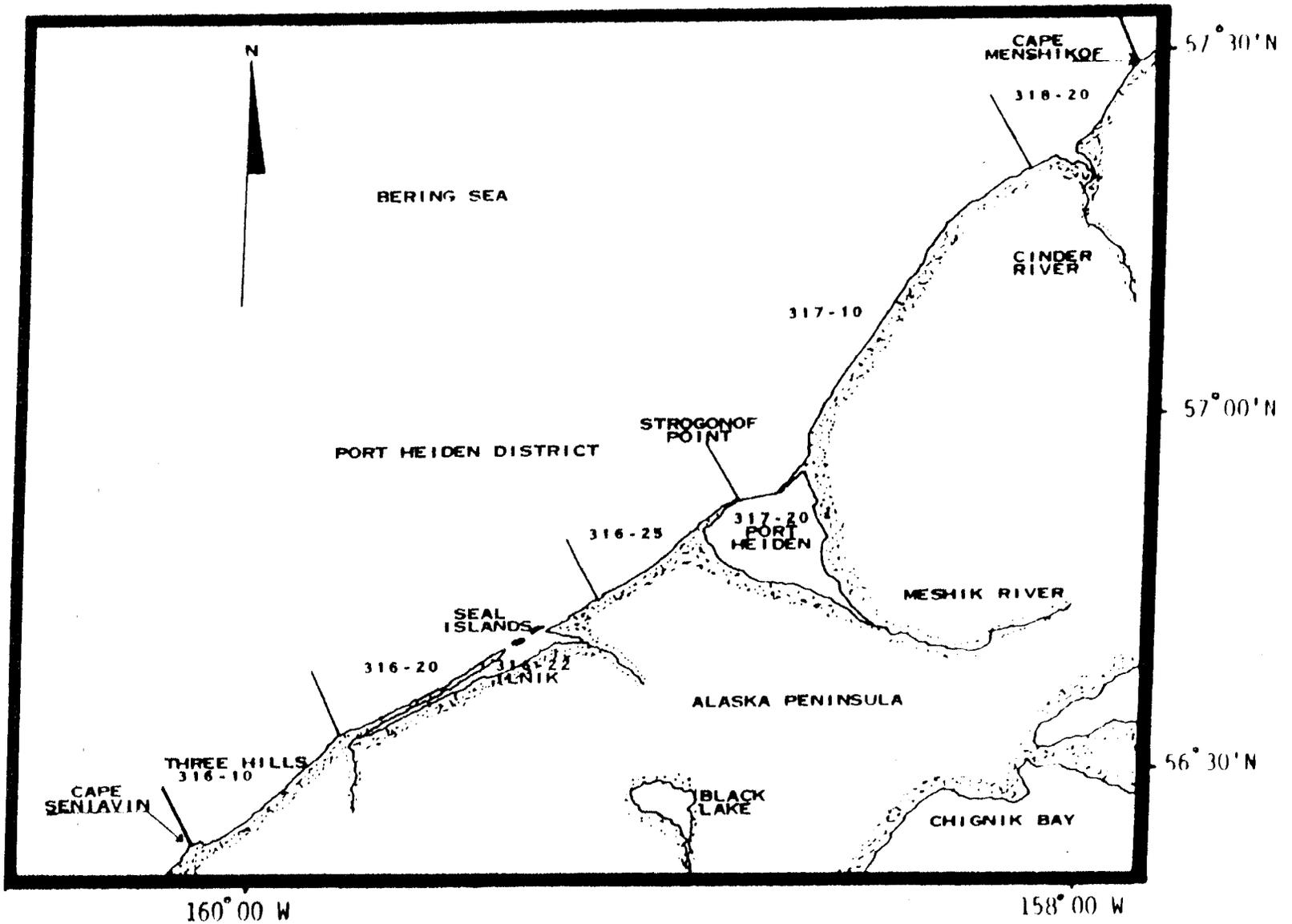


Figure 4. Map of the Alaska Peninsula Area from Cape Seniavin to Cape Menshikof with the statistical herring fishing areas shown.

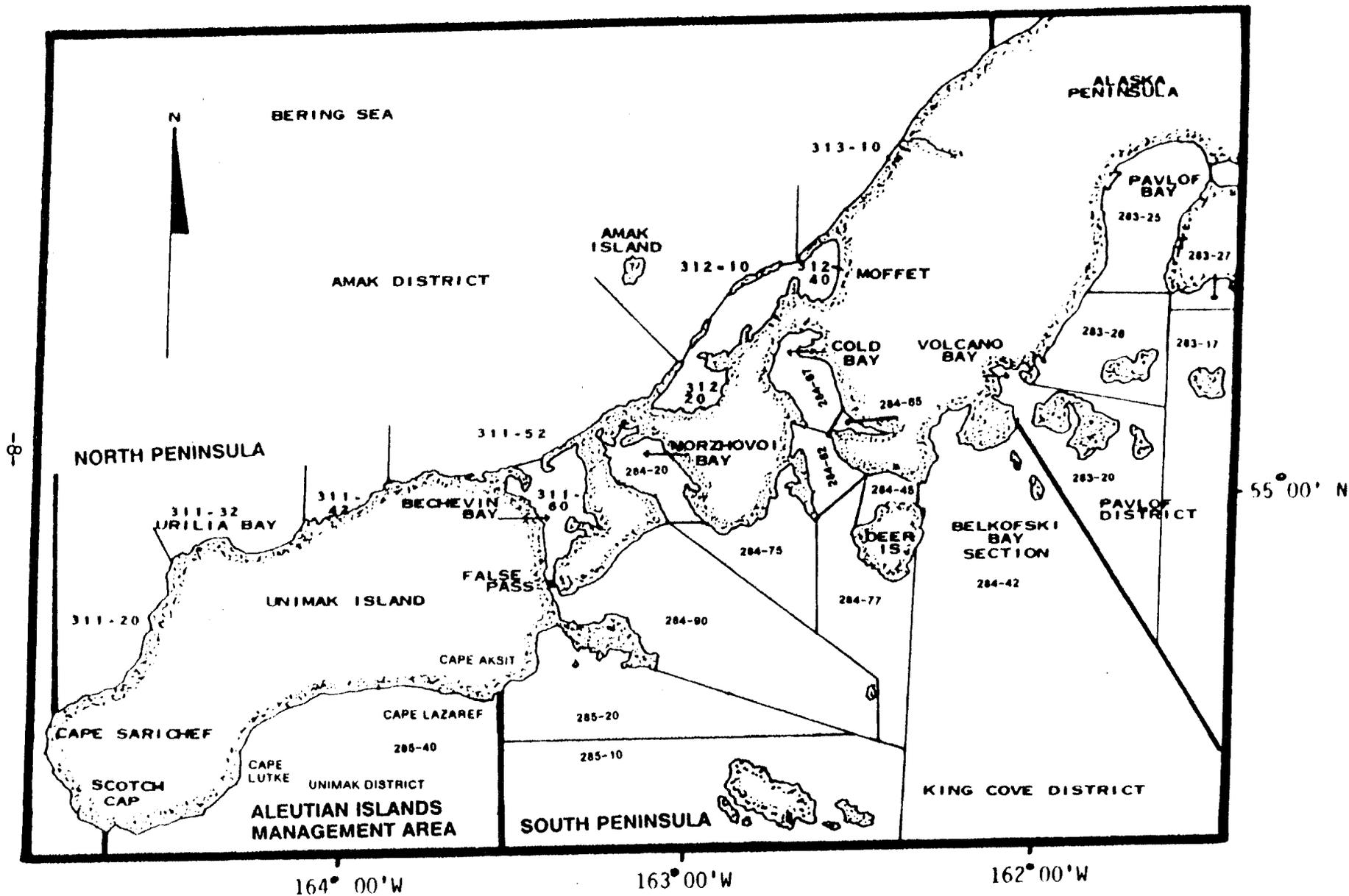


Figure 6. Map of the Alaska Peninsula Area from Cape Sarichef to Pavlof Bay with the statistical

Table 1. Alaska Peninsula Management Area commercial herring sac roe catch by time period and area, 1979-91 (short tons).

Year	South Peninsula	South Peninsula Time Period	North Peninsula	North Peninsula Time Period	Total
1979	10.1	July 4-July 4	0.0		10.1
1980	453.0	May 18-July 14	0.0		453.0
1981	787.0	May 9-June 23	0.0		787.0
1982	176.2	May 31-June 14	513.5	May 31-June 12	689.7
1983	0.0		637.5	May 9-May 29	637.5
1984	210.4	May 13-June 1	431.2	May 24-June 8	641.6
1985	345.0	June 1-June 11	716.0	May 24-June 4	1,061.0
1986	281.5	June 7-June 14	888.9	May 18-May 30	1,170.4
1987	319.0	June 8-June 19	512.4	May 9-June 5	831.4
1988	376.8	May 31-June 20	293.7	May 17-June 15	670.5
1989	310.0	May 13-June 19	744.7	May 28-June 23	1,054.7
1990	312.2	May 14-June 14	272.8	June 4-June 19	585.0
Average	319.9 a/		542.5		862.4
1991	157.4	May 16-June 11	1,313.0	May 17-July 4	1,470.5

a/ Five year 1986-90 average

Table 2. North Peninsula commercial herring sac roe catch by geographic area, 1982-91 (short tons).

Year	Deer Island	Herendeen Bay	Moller Bay	Bear River Bering Sea Coast	Total
1982	0.0	287.5	180.0	46.0	513.5
1983	0.0	520.5	36.0	81.0	637.5
1984	0.0	181.0	250.2	0.0	431.2
1985	73.0	100.0	256.0	287.0	716.0
1986	41.5	112.5	261.4	473.5	888.9
1987	0.0	160.8 a/	344.3	7.3	512.4
1988	0.0	8.2	285.5	0.0	293.7
1989	0.0	67.0	116.3	561.4	744.7
1990	0.0	155.8	117.1	0.0	272.8
1986-90 Average	8.3	100.9	224.9	208.4	542.5
1991	167.0	156.3	689.6	300.2	1,313.0

a/ at least 11 tons were caught in the Deer Island-Mud Bay Section.

Herendeen Bays, and the Bering Sea coast eastward from Port Moller (Table 2). The run timing of the North Peninsula stocks appear to be later than the Togiak stocks.

The South Peninsula herring sac roe fishery continues to develop since it began in 1979, with only Stepovak Bay, Canoe Bay, and the Shumagin Islands producing annual harvests since 1986 (Tables 1,3). Significant landings occurred in 1980 (453.0 tons), and peaked in 1981 (717.0 tons). The Board of Fisheries closed the South Peninsula sac roe fishery in 1983, allocating all catches to a food and bait fishery that failed to develop. Since 1984, the Board of Fisheries allocated the catch between the sac roe fishery (75% of the allowable harvest) and the food and bait fishery (25% of the allowable harvest). Since 1980 and during years in which commercial harvests occurred, landings were reported from 18 geographically separated locations; of these locations, only Canoe Bay produced an annual harvest (Table 3).

Food and bait deliveries occurred during 1982 (565.0 tons) and 1991 (161.4 tons) in South Peninsula waters (Table 4). During years that the North Peninsula herring food and bait season has been open, no fishing effort or deliveries have been documented.

The objectives of this report were: (1) to present the numbers of herring in the commercial catch for each statistical day in the Alaska Peninsula and Aleutian Islands Management Areas during 1991; (2) to estimate the age and sex composition of harvests; (3) to estimate the mean length and weight of gonads and herring harvested in commercial fisheries; and (4) to estimate the biomass of herring within each area. This information will provide a data base for developing brood tables, forecasting runs, and evaluating management goals. This report is intended as a reference document; interpretation and discussion of the data are therefore limited.

METHODS

Commercial catch data were compiled by the Division of Commercial Fisheries of the Alaska Department of Fish and Game (ADF&G). These data were based on computer tabulations originating from individual sale receipts (fish tickets) given to fishermen at the time of delivery. Fish tickets and the computer generated summaries were edited by ADF&G Alaska Peninsula staff for errors and omissions. Because extensive fish ticket editing is usually required to finalize the data for any given year, later reports may contain minor differences in the catch information listed in this report.

Catches were sampled throughout the season from harvests in the fishing areas. Catch sampling occurred at Port Moller, Sand Point, and Canoe Bay. Herring were randomly sampled, usually collected from the holds of tender vessels to minimize scale loss. The harvest area of each tender sampled was determined through vessel operator interviews and fish ticket information.

Tender operators purchased fish from catcher vessels operating in combine with them. Since all catch sampling occurred before sorting within the cannery, there was no preselection of herring other than from delivery areas; although not

Table 3. South Peninsula commercial herring sac roe catch by geographic area, 1980-91 (short tons).

Year	Stepovak Bay a/	Balboa Bay	Pavlof Bay	Canoe Bay	Volcano-Dolgoi	Belkofski Bay	Lenard Harbor	Dolgoi Harbor	Shumagin Islands	Total
1980	195	132	114	12						453.0
1981	122	36	225	206	65	23	110			787.0
1982		5.0		171.2						176.2
1983 b/										0.0
1984	30.0	25.0		155.4						210.4
1985	11.0		95.0	239.0						345.0
1986 c/			61.0	140.5	13.0	8.0	59.0			281.5
1987 c/			92.0	118.0		38.0	59.0	12.0		319.0
1988	d/ 0.3	11.0	69.0	236.5	17.0	12.0	31.0			376.5
1989	39.0	17.0	53.0	148.0			9.0	5.0	39.0	310.0
1990	71.7	20.8		120.4		3.2	5.9		90.4	312.2
1986-90 Average	22.2	9.8	55.0	152.7	3.4	12.2	32.8	3.4	25.9	317.4
1991	19.3	19.3		77.5					41.4	157.4

a/ The 1984-88 catches came from Ramsey Bay, the 1989 catch came from Granville Bay.

b/ In 1983 the South Peninsula sac roe fishery was closed, all herring catches were allocated to a food and bait fishery that did not develop.

c/ Stepovak Bay (Kupreanof Point to Swedania Point) was closed during 1986-87 due to the herring biomass being below the threshold required for a commercial fishery.

d/ Seven tons of green herring were dumped on May 7, and an additional two tons were dumped on May 11.

Table 4. South Peninsula commercial herring food and bait catches, 1982-91 (short tons).

Year	Harvest	Time Period
1982	565.0	January - February
1983	0.0	
1984	0.0	
1985	0.0	
1986	0.0	
1987	0.0	
1988	0.0	
1989	0.0	
1990	0.0	
1991	161.4	August 18 - August 19
1982-91 Average	72.6	

tested, each sample was assumed to be representative of the harvest within a sample area. While this insured that samples were randomly selected from each tender sampled, the samples may not be characteristic of the population structure because the distribution of the population is unknown in the fishery.

Age compositions were computed for the catch for each area sampled. Age was determined by examining scales (Warner and Shafford 1970). Scales were taken from the preferred area, which was located on the left side of the herring three rows below the lateral line and three scales posterior to the center of the operculum plate (Anonymous 1986). One scale was taken from each herring. Ages were recorded in actual fish age in years. The accuracy of age determination was not tested.

Standard length measurements were taken from the anterior most portion of the fish, including the lower jaw with the mouth closed, to the end of the vertebra (hypural plate) using a meter stick with 1 mm gradations and reading the measuring device to within 1 mm. Accuracy of a length measurement was within ± 5 mm. Mean lengths were calculated from an unweighted composite of the data collected from each area sampled.

Weight measurements of fish were taken using a digital scale with 2.0 g gradations and reading the scale device to within 2.0 g. Accuracy of a weight measurement was within ± 2.0 g. Mean weights were calculated from an unweighted composite of the data collected from each area sampled.

Sex compositions and sexual maturity were computed for each area sampled. Sex and sexual maturity was determined by either squeezing the fish or by internal observation of the gonads. Sexual maturity of herring were classified as: (1) virgin herring, (2) virgin herring with small sexual organs, (3) gonads occupying about half the ventral cavity, (4) gonads almost as long as body cavity, (5) gonads fill body cavity, (6) ripe gonads, (7) spent herring, and (8) recovering spent herring.

Biomass estimates of herring schools occurred during aerial surveys. The methodology of these surveys is described by Anonymous (1986). Observers fly at a recommended altitude of 1,500 feet and count the number of schools of herring and measure the length and width of each school. Each school is classified into one of three size classes based on its surface area: small schools with an area ≤ 50 m²; medium-sized schools with a surface area > 50 m² and ≤ 450 m²; and large schools with a surface area > 450 m². The number of schools in each size-class are converted to Relative Abundance Indices (RAI) by assuming that one small school equals one RAI, one medium-sized school equals five RAI, and one large school equals surface area/50 m². Aerial observers also classify the conditions on each survey with a rating system: one equals excellent, two equals good, three equals fair, four equals poor, five equals unsatisfactory. A conversion factor of 1.52 short tons/RAI is used for schools observed in water depths of 16 feet or less and 2.58 short tons/RAI is used for schools observed in water depths of 16 to 26 feet. In deep water, no attempt was made to convert RAI units into tonnages due to the lack of data. Conversion factors were calculated from surveys of schools of known biomass and surface area in known water depths that were conducted with commercial fishing vessels in Bristol Bay in 1983. If more than one survey of an area was conducted in a single day, then the largest number of RAI's recorded in each area was chosen as the most accurate index of biomass, because observers were more likely to underestimate the biomass

than they were to overestimate the biomass. Some schools of fish, especially in the Bering Sea and Stepovak Bay, may have been capelin or other finfish.

Harvest guidelines were established pre-season and were based on past fishing performance, age class data, and biomass estimates from ADF&G and industry aerial surveys (Table 5). Areas where little or no data on stock biomass was known were open for exploration.

SAC ROE FISHERY

Results

In 1991, 85 landings were made in the Alaska Peninsula Management Area by 18 purse seine permit holders. The 1991 catch of 1,470.5 tons of herring was the largest catch ever for the Alaska Peninsula and was about 71% higher than the 1986-91 average harvest and about 2.5 times larger than the 1990 catch (Table 1). The increased catch was due to above average Port Moller District catches.

In 1991, 19 purse seine and 2 set gill net permit holders, 13 tenders, and three companies indicated an interest in fishing in the Alaska Peninsula during the sac roe season. However, only 18 purse seine permit holders made at least one landing and only two companies purchased herring. This was an increase of 14 purse seine permit holders making deliveries and a decrease of three companies buying herring from the 1990 level.

The total 1991 commercial herring sac roe and bait catch during the sac roe season for the Alaska Peninsula and Aleutian Islands Management Areas was 1,470.5 tons (1,163.2 tons of sac roe product and 307.3 tons of bait product), with an ex-vessel value of about \$439,244.

Fishing Effort

In 1991, fishing effort was three times greater than in 1990, with most of the increase in effort occurring in the Port Moller District. The increased effort is primarily due to the South Peninsula salmon season being delayed until June 13, which gave salmon fishermen time to participate in the herring fishery.

In the Port Moller District, during the 1986-88 seasons, there was an average of 52 vessels present, although only a few permit holders actually made landings. Fishermen often stop in Port Moller on their way from the Togiak herring fishery for a few days to explore for commercial quantities of herring. In 1986, a trend began of increasing fishing effort effectively harvesting the early returning fish stocks. In order to shift fishing pressure from the earlier arriving stocks to the later more abundant stocks, the Port Moller District opening was initially delayed until May 30 from 1989 to 1991. However, the fishery may have opened prior to May 30 by emergency order if a large biomass of herring was documented in the area. The later opening date in the past three seasons has caused a trend

of decreasing effort. Fishermen returning from Togiak tend to pursue halibut or salmon fisheries rather than wait for the Port Moller herring fishery to open.

In 1991, a total of 10 tenders representing two processing companies registered for the Port Moller sac roe fishery. At least 15 purse seine skippers indicated interest in fishing for herring in the Port Moller District, although only 11 purse seine permit holders made at least one delivery. In 1991, a total of 5 tenders representing one processing company registered for the South Peninsula sac roe fishery. All 10 purse seine vessels that expressed interest in fishing South Peninsula waters made at least one delivery. Two set gill net skippers also expressed interest in fishing South Peninsula waters, but did not make any deliveries.

In areas open for exploration (Port Heiden District, Amak District, Unimak District, and General Sections of the King Cove and Sand Point Districts), liberal fishing time was allowed to give fishermen the opportunity to find and exploit unknown herring stocks. The liberal fishing time did not produce a harvest from any new herring stocks (Table 3).

North Peninsula

The 1991 projected guideline herring harvest for North Peninsula commercial herring fisheries was 300 tons (Table 5), which does not include herring harvested in sections open for exploration (McCullough 1991). The Port Heiden and Amak Districts were open for exploration continuously from April 15 through June 30. The Bear River, Western, Inner Port Moller Bay, and Outer Port Moller Bay Sections of the Port Moller District were open from May 17 through July 15. The Herendeen Bay and Deer Island-Mud Bay Sections of the Port Moller District were open from May 18 through July 15.

ADF&G herring staff arrived in Port Moller on May 14. Already on the scene were four fishing vessels without benefit of a spotter plane, and a single local processor lacking a herring crew. The first spotter pilot arrived in Port Moller on May 17 with word that about 1,000 tons of herring in several schools were present in Port Moller Bay. An ADF&G survey confirmed the pilot's report, and the Port Moller District, except for Herendeen and Deer Island-Mud Bay Sections, was opened at 7:00 P.M. May 17. No advanced notice for commercial fishing periods are given in the Port Moller District because herring often enter the district and spawn on a single tide. Because the first tender on the grounds was not due until the early morning of May 18 and because the processor would have to fly a crew into the area; the combine of fishing vessels limited their catch to about 90 tons, the capacity of the tender due to arrive shortly. A quota of 90 tons for Outer Port Moller Bay and 70 tons for Inner Port Moller Bay was established. Most of the herring observed in Outer Port Moller Bay on the afternoon of May 17, and an additional 250 tons that moved into Outer Port Moller Bay during the evening, headed into Inner Port Moller Bay during the night.

An ADF&G aerial survey on May 18 showed that only a few very small schools, believed to be spent herring remained in Outer Port Moller Bay. The visibility in Inner Port Moller Bay was poor and no herring were spotted. At the entrance to Herendeen Bay, several schools were observed with a minimum biomass estimate for the Herendeen Bay stock of 450 tons. At 1:00 P.M., the Deer Island-Mud Bay

Table 5. Alaska Peninsula Management Area commercial herring sac roe and food and bait guideline harvest levels, 1991 (short tons). a/

Area	-----Guideline Harvest-----		Total
	Sac Roe	Food/Bait	
South Peninsula			
Sand Point District			
Stepovak Bay Section	75	25	100
Balboa Bay Section	19	6	25
Beaver Bay Section	19	6	25
Pavlof District			
Pavlof Bay Section	56	19	75
Canoe Bay Section	94	31	125
General Section (Volcano Bay)	19	6	25
King Cove District			
Belkofski Section	15	5	20
Cold Bay Section	26	9	35
Deer Passage Section	15	5	20
Total	338	112	450
North Peninsula			
Port Moller District b/			
Herendeen Bay Section	90		75
Inner Moller Bay Section	90		75
Outer Moller Bay Section	120		100
Bear River Section			
Total	300		250
<hr/>			
Total	638	112	750

a/The Aleutian Islands Management Area is open for exploration, no deliveries have occurred. Guideline harvest levels have not been established for areas open for exploration.

b/Herring abundance in the Port Moller District is difficult to estimate. If the Alaska Department of Fish and Game documents a herring biomass larger than expected the guideline harvest level will be adjusted inseason. Catches in the Port Heiden District may be subtracted from the Port Moller District guideline harvest if it is suspected that the herring are traveling into the Port Moller District.

and Herendeen Bay Sections were opened for commercial herring fishing. The guideline harvest levels for the District were set as they were pre-season: Inner Port Moller Bay at 90 tons, Herendeen Bay and Deer Island-Mud Bay Sections at 90 tons, and the Outer Port Moller Bay Section at 120 tons. Two additional tenders arrived and the processor flew in a crew from other areas.

Aerial surveys on May 19 indicated that additional herring were arriving in the Port Moller District. Most of these fish moved into Herendeen Bay, where all fishing activity was centered. Herendeen Bay and Outer Port Moller Bay were closed in the morning of May 20 with a harvest of about 167 tons from the Herendeen Bay stock.

Aerial surveys on May 20 indicated about 2,500 to 3,000 tons of spawned-out herring in the Bear River Section, which were probably the herring observed on May 17-19 that moved into Inner Port Moller Bay Section, spawned, and were now leaving the area.

Aerial surveys continued to find additional herring moving into Herendeen and Port Moller Bay during the next several days, and on May 23 the Outer Port Moller Bay Section was reopened to commercial herring fishing. On May 24-26, the fleet caught several schools of herring (84 tons) in the Outer Port Moller Bay and Bear River Sections. Most of the biomass coming into the District during this time period were believed to have spawned in the Inner Port Moller Bay Section.

Effort shifted to Inner Port Moller Bay on May 27-30, with about 67 tons being harvested. During this time period most of the herring observed coming into the District moved into the Inner Port Moller Bay Section.

On June 2-6, ADF&G observed a biomass of 1,000 to 1,500 tons of herring in the Bear River Section, and the entire Port Moller District was again opened to commercial herring fishing. About 594 tons of herring were harvested during this period, and the total biomass estimate to date for Port Moller, Herendeen Bay, and Bear River Section stocks was about 6,000 tons. On June 5, the processor suspended buying because enough herring had been caught to plug their processing capabilities for about 3 days. Most of the herring were caught on June 2-3. The first herring to be processed on June 2 had a roe percent of about 10%. All herring had been feeding heavily on krill, and within 21 hours of being caught problems with "belly burn" were becoming apparent. By June 3, the roe percentage dropped to 7%. The herring stomachs continued to release digestive acids, and the bellies of the herring were falling out of the fish. This in turn caused the roe to fall out of the fish. Processing continued over the next two days, but when roe recovery dropped below 7% the herring were no longer marketable. On June 6, the Port Moller and Port Heiden Districts were closed due to excessive waste of the resource because 307.3 tons of herring were dumped due to the "belly burn" problem. Although these herring were dumped the processor, fishermen, and tender operators negotiated a price settlement of \$50 per ton to both fishermen and tender operators for all herring purchased as "bait herring". The processor suspended buying of herring for the remainder of the season, and most of the tenders and fishing fleet departed.

Ripe herring continued to arrive in the District, moving into both Herendeen and Inner Port Moller Bay Sections. By June 12, the district biomass was estimated to be about 7,000 tons. Two fishing vessels and a floating processor with a daily capacity of 30 tons moved into the district on June 12. The Port Moller

District was opened on June 12 to herring fishing with the catch being limited to the daily processing capability of the processor to avoid further problems associated with "belly burned" fish.

By June 12, the Port Moller District catch was an estimated 1,012 tons; the Inner Port Moller Bay stock biomass was estimated at 4,201 tons, the Herendeen Bay stock biomass was estimated at 2,365 tons, and the Bear River stock biomass at 161 tons. The estimated harvest and biomass resulted in an exploitation rate of about 15 percent. During the period June 12 to July 4, an additional 250.6 tons were harvested from Herendeen Bay, Inner Port Moller Bay, and Outer Port Moller Bay.

Intensive aerial surveys by ADF&G to document spawning biomass and locations were not possible after June 5 due to the large area, weather, muddy water, and the unpredictable appearance of herring. Also, the latter portion of the fishery takes place during the beginning of the June sockeye salmon fishery when personnel is limited.

There were industry reports of herring entering the area from June 14 through June 26. An estimated 575 tons of new herring entered the district after ADF&G surveys were discontinued. Industry also reported hundreds of tons of juvenile (age 1 to 3) herring feeding in Herendeen Bay.

From May 23 through July 5, commercial spotter pilots and ADF&G observers reported about 30-40,000 tons of capelin in the Bear River and in Herendeen Bay Sections. By May 19, spent herring could be found in both the Inner and Outer Port Moller Bay Sections. By May 20 some 1,100 tons of spent herring from the Inner Port Moller Bay stock moved out of Port Moller and spent several days near the mouth of Bear River on the outside coast. Spent herring from the Herendeen Bay stock seem to acted differently than the Port Moller Bay stock. The spent herring in Herendeen Bay appear to remain within Herendeen Bay and at times mix with the new green and ripe herring entering Herendeen Bay. There appears to be only limited mixing of the green, ripe, and spent herring with the juvenile herring.

Table 6 lists ADF&G aerial surveys and industry reports after June 5 when ADF&G surveys were discontinued. From May 17 through June 5, 14 aerial surveys were flown in the Port Moller District by ADF&G. In past years biomass estimates have been difficult due to survey conditions and the rapid arrival and departure of fish. In 1991, fish were visible in substantial numbers on nine different surveys. Aerial survey estimates added to catches after surveys were discontinued resulted in an estimated biomass of 4,651 tons for the Inner Port Moller Bay stock. Herring spotted in Herendeen were added to the catch after June 12 and resulted in an estimated biomass of 2,278 tons for the Herendeen Bay stock. Herring were also observed spawning along the outside coast, south of the mouth of Bear River; this stock was estimated through catches and aerial surveys at 1,471 tons. Because survey conditions in the Port Moller District are often difficult and herring move in and out of the area over a period exceeding 60 days, the biomass estimates should be considered a reliable minimum biomass estimate. This data established the Port Moller District biomass at 8,400 tons, resulting in an exploitation rate of 16%.

No herring were caught in the Amak and Port Heiden Districts, although effort occurred in the Port Heiden District.

Table 6. Alaska Department of Fish and Game North Peninsula aerial herring biomass surveys, 1991 (short tons).

Date	Herendeen Bay			Inner Moller Bay			Outer Moller Bay /a			Bear River		
	RAI/b	Tons/c	Rating/d	RAI/b	Tons/c	Rating/d	RAI/b	Tons/c	Rating/d	RAI/b	Tons/c	Rating/d
May 17	0	0	2	276	514 /e	2	422	808 /e	2	0	0	2
May 18	180	1,080 /e	4	0	0	1	67	103	3	0	0	3
May 19	3	18	2	22	34 /e	2	12	18 /e	2	0	0	2
May 20	141	843	2	0	0	4	17	44 /e	2	928	2,394 /e,f	3
May 21	195	502 /e	2	274	417 /e,g		70	182 /e	1	146	377	3
May 22	0	0	3	11	17	3	0	0	2	67	174	2
May 24	0	0	2	9	13	2	186	282 /e	2	0	0	2
May 27	0	0	2	4	7 /e	2	0	0	2	0	0	3
May 28	0	0	2	51	77 /e,h	2	0	0	2	0	0	2
May 29	0	0	3	34	51 /e	3	0	0	3	0	0	3
May 31				124	188 /e	2						
June 3	0	0	1	0	0	1	0	0	1	253	652 /e,i	2
June 4				18	46	3	159	383	2	62	160 /e	2
June 5	28	43 /e	1	310	471 /e,j	1	107	162 /e	1	28	73 /e	1
June 6										0	0	1
June 14		135 /e,k										
June 23					125 /e,k							
June 26		115 /e,k			200 /e,k							
Total Biomass	2,278			4,651						1,471		

RAI units express the surface area of herring schools in terms of small schools (surface area equal to 532 square feet). For example, 10 RAI units are equivalent to 10 small herring schools, each with a surface area of 538 square feet.

-Continued-

Table 6. (page 2 of 2)

/a No herring were observed spawning in the Outer Port Moller Bay Section. Herring in this Section were assigned to the Herendeen Bay or Inner Port Moller Bay stocks.

/b Relative Abundance Index (RAI): small school (less than 538 square feet) = 1 RAI unit
medium school (532 square feet to 4,841 square feet) = 5 RAI units
large school (square feet/538 square feet)

/c Tons: RAI units are multiplied by 1.52 (schools in water less than 16 feet of depth)
RAI units are multiplied by 2.58 (schools in water 16 to 26 feet of depth)

/d Rating of survey: (1) Excellent, (2) Good, (3) Fair, (4) Poor, (5) Unsatisfactory

/e Used in calculating biomass estimate; all herring considered new fish.

/f 1,298 tons were considered new herring.

/g 242 tons were considered new herring.

/h 17 tons were considered new herring.

/i 352 tons were considered new herring.

/j 400 tons were considered new herring.

/k Commercial pilot report.

In the Port Moller District from May 17 through July 4, 1,005.8 tons of sac roe and 307.3 tons of bait herring were harvested by 11 purse seine permit holders (Table 7). The average roe recovery was 9.12% with an average price of about \$400/ton for 10% roe recovery and \$50/ton for the 307.3 tons that were purchased as bait herring, making the ex-vessel estimated value of the fishery \$378,921. About 15 purse seine permit holders indicated interest in fishing Port Moller waters, but only 11 purse seine permit holders made at least one delivery. A total of 59 deliveries were made.

Commercial catches of herring from the Port Moller District from 1982 to 1991 were landed from May 9 to July 4 (Figure 5, Table 1). Most catches were taken during a time period of 20 days or less (mid-May to mid-June). In 1991, the commercial catch occurred throughout the Port Moller District: Bear River Section (300.1 tons; Table 5), Outer Port Moller Bay Section (531.1 tons), Inner Port Moller Bay Section (158.4 tons), and Herendeen Bay and Mud Bay-Deer Island Sections (323.3 tons). Not since the 1988 season had herring been observed in the Port Moller District in commercial quantities prior to May 28.

The Port Moller District fishery was dominated by age 4 herring (Table 8, 9, Figure 7). Herendeen Bay catches had 72% age 4 and 11% age 7 herring and the Deer Island-Mud Bay catches had 65% age 4 and 18% age 7 herring. The Inner Port Moller Bay catches had 59% age 4, 13% age 5, and 16% age 7 herring and the Outer Port Moller Bay had 74% age 4 and 11% age 7 herring. Bear River area catches had 86% age 4 herring. Catches from Cape Kutuzof were different than other Port Moller District catches, with 37% age 4 and 40% age 7 herring. Age 3 herring which are typically only partially recruited into the fishery and comprised less than 3% of all catches. Typically a Bering Sea year class is not fully recruited into the fishery until age 6. The amount of age 4 herring in the catches in 1991 should produce substantial catches of age 5 herring in 1992.

Table 10 lists the North Peninsula herring sac roe average weights and lengths of herring samples by age group. Herring harvested in coastal waters near Cape Kutuzof averaged the largest (233 g and 257 mm) and herring harvested near the Bear River were the smallest (139 g and 227 mm).

Commercial fishermen reported spent herring on May 18 in the Outer Port Moller Bay Section; these herring probably spawned in the Inner Port Moller Bay Section on May 17. By May 20, an estimated 1,100 tons of spent herring were observed by ADF&G in the Bear River Section. Two small schools of herring, each about five tons, were observed by ADF&G on May 24 and May 25 spawning at low tide in the Inner Moller Bay area. The schools were located Southwest of Harbor Point in shallow water, spawning among sand bars. No vegetation was visible from the air where spawning occurred. On June 2-3, two different commercial spotter pilots reported herring spawning south of the mouth of Bear River among some large rock piles; this area had been the mouth of Bear River for several years, but in 1990 the river mouth cut a new channel about one mile further north. Commercial fishermen and pilots reported herring spawn from May 18 through early July in Left Head and Right Head of Moller Bay, and in several locations on several different dates along the beach from Harbor Point to Left Head in Moller Bay. Herring spawn was also reported in the sand flats east of Point Divide. No spawning herring were observed in Herendeen Bay.

Table 7. North Peninsula commercial herring sac roe catch by area, day, and percent roe, 1991 (short tons).

Area	Date	Catch		Percent Roe
		Food/Bait	Sac Roe	
Bear River (Bering Sea Coast)	May 25		8.2	15.50
	June 2		108.7	9.83
	June 3	116.3	67.0	7.57
	Total	116.3	183.8	9.26
Outer Moller Bay	May 17		96.6	8.00
	May 24		68.4	7.55
	May 26		7.7	9.80
	May 27		7.6	7.70
	June 3		41.7	8.20
	June 4	128.6	54.2	7.89
	June 5	62.3	42.7	8.93
	July 3		21.3	10.00
Total		190.9	340.2	8.19
Inner Moller Bay	May 27		3.0	8.30
	May 29		35.4	8.09
	May 30		5.4	7.40
	May 31		14.9	7.80
	June 15		15.5	10.00
	June 24		22.2	10.00
	June 25		28.1	10.00
	June 26		33.9	10.00
	Total			158.4
Herendeen Bay	June 12		26.8	10.00
	June 14		49.5	10.00
	June 18		7.4	10.00
	June 21		9.4	10.00
	June 25		28.2	10.00
	July 2		10.3	10.00
	July 4		24.8	10.00
Total			156.3	10.00
Deer Island	May 18		3.0	10.10
	May 19		99.2	9.79
	May 20		64.8	10.10
Total			167.0	10.59
Total		307.3	1,005.8	9.12

Table 8. Estimated age composition of North Peninsula commercial herring sac roe catches by area and percent, 1985-91.

Year	-----Ages-----									
	2	3	4	5	6	7	8	9	10	11+
Herendeen Bay										
1985	0	5	49	21	15	6	4	0	0	0
1986	0	0	3	25	13	20	21	17	1	0
1987	0	2	4	22	24	17	13	10	6	2
1988	0	3	23	30	22	9	4	3	3	2
1989	0	0	2	62	22	5	1	1	0	7
1990	0	14	3	1	57	15	3	1	1	5
1991	0	2	72	5	2	11	4	0	2	3
Deer Island-Mud Bay										
1991	0	1	65	7	3	18	5	0	1	1
Inner Moller Bay										
1985	0	1	12	8	15	33	27	2	0	1
1986	0	1	7	21	12	18	19	20	1	1
1987	0	2	11	13	22	12	11	17	11	0
1988	0	1	30	29	12	6	5	5	8	5
1989	0	1	1	67	19	3	1	2	2	4
1990	0	13	4	2	49	16	5	2	2	6
1991	0	1	59	13	2	16	1	5	2	1
Outer Moller-Bering Sea Coast										
1985	0	1	26	16	20	17	17	1	1	0
1986	0	0	2	22	13	21	23	18	1	0
1987	0	2	48	9	14	5	11	8	3	0
1988	No catch in this section									
1989	0	0	0	6	26	6	24	7	10	21
1990	90	10	0	0	0	0	0	0	0	0
1991 /a	0	3	74	6	1	11	2	1	1	0
Bering Sea Coast										
Bear River area										
1991	0	2	86	8	0	4	1	0	0	1
Cape Kutuzof area										
1991	0	0	37	10	0	40	9	2	2	2

/a Outer Port Moller Bay Section samples only.

Table 9. Estimated age composition of North Peninsula commercial herring sac roe purse seine catches by area and day, 1991.

Date	Sample Size	Ages									
		2	3	4	5	6	7	8	9	10	11+
Herendeen Bay											
May 19	299	0.0	1.0	83.6	6.4	1.3	4.0	0.7	0.3	0.7	2.0
May 20	81	0.0	0.0	54.3	4.9	1.2	12.3	13.6	1.2	4.9	7.4
May 29	91	0.0	3.3	79.1	3.3	1.1	6.6	2.2	0.0	3.3	1.1
June 14	79	0.0	6.3	34.2	3.8	3.8	41.8	7.6	0.0	1.3	1.3
Total	550	0.0	2.0	71.5	5.3	1.6	11.1	3.8	0.4	1.8	2.5
Deer Island-Mud Bay											
May 19	154	0.0	1.3	75.3	7.8	1.9	5.2	5.2	0.0	2.6	0.6
June 2	130	0.0	0.0	52.3	6.9	3.1	32.3	4.6	0.0	0.0	0.8
Total	284	0.0	0.7	64.8	7.4	2.5	17.6	4.9	0.0	1.4	0.7
Inner Moller Bay											
May 29	87	0.0	1.1	58.6	12.6	2.3	16.1	1.1	4.6	2.3	1.1
Total	87	0.0	1.1	58.6	12.6	2.3	16.1	1.1	4.6	2.3	1.1
Outer Moller Bay											
May 17	191	0.0	1.0	77.5	8.9	2.1	5.8	1.0	3.1	0.5	0.0
May 24	56	0.0	3.6	55.4	8.9	0.0	17.9	8.9	1.8	1.8	1.8
May 30	87	0.0	4.6	69.0	2.3	1.1	17.2	1.1	1.1	2.3	1.1
June 3	98	0.0	1.0	44.9	10.2	1.0	32.7	8.2	1.0	0.0	1.0
June 4	248	0.4	4.0	89.5	2.8	0.8	2.4	0.0	0.0	0.0	0.0
Total	680	0.1	2.8	74.3	6.0	1.2	10.9	2.4	1.3	0.6	0.4
Bering Sea Coast											
Bear River area											
May 20	135	0.0	2.2	87.4	6.7	0.0	3.0	0.0	0.0	0.0	0.7
June 4	38	0.0	0.0	78.9	13.2	0.0	5.3	2.6	0.0	0.0	0.0
Total	173	0.0	1.7	85.5	8.1	0.0	3.5	0.6	0.0	0.0	0.6
Cape Kutuzof area											
June 2	68	0.0	0.0	36.8	10.3	0.0	39.7	8.8	1.5	1.5	1.5
Total	68	0.0	0.0	36.8	10.3	0.0	39.7	8.8	1.5	1.5	1.5

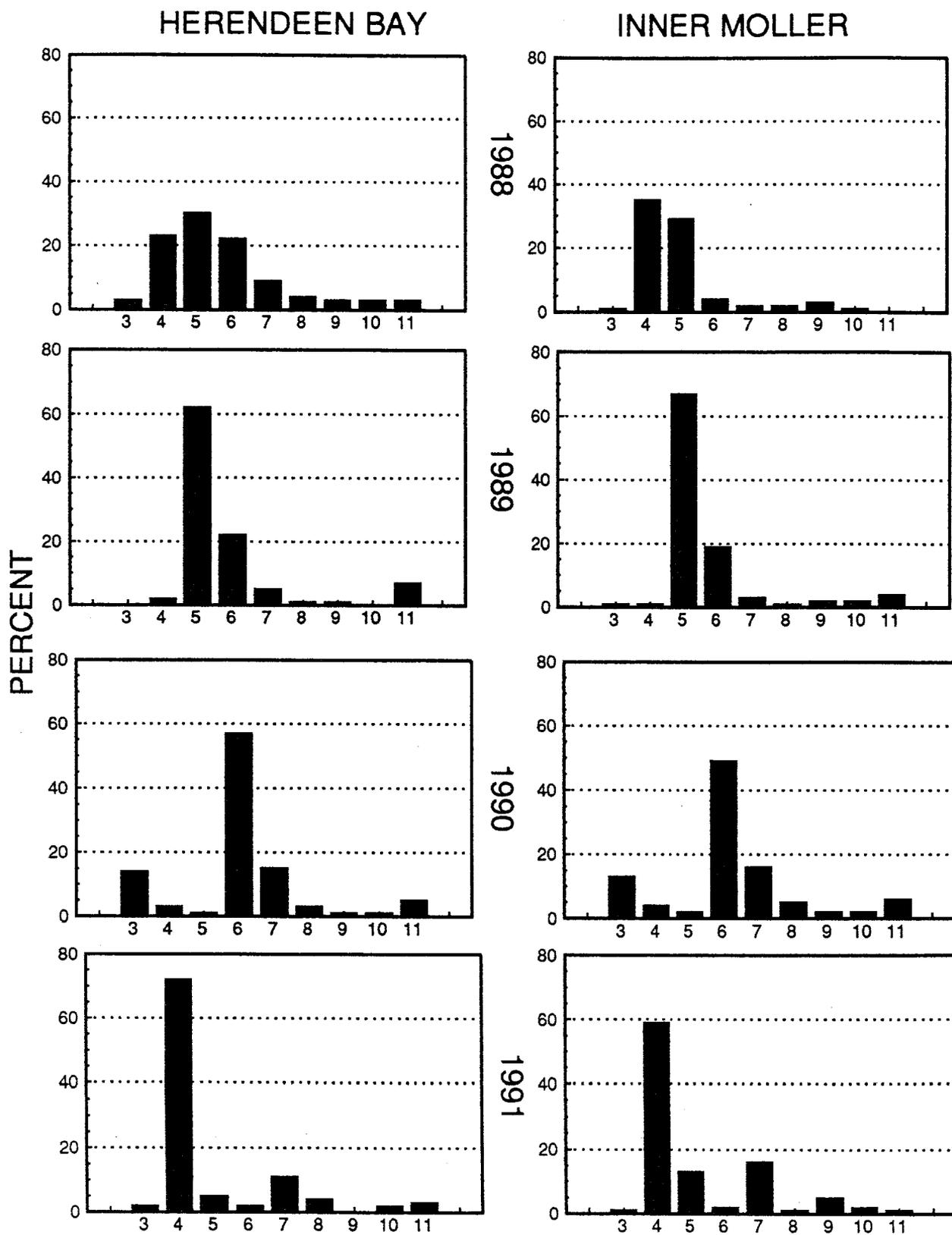


Figure 7. Age distribution of annual herring sac roe catches from Herendeen and Inner Moller Bays, 1988-91.

Table 10. Alaska Peninsula Management Area herring catch summary of average weights (g) and lengths (mm) by age, 1991.

Fishery/Area	Weight Length	Harvest (tons)	Sample Date	Age											Average	Sample Size
				2	3	4	5	6	7	8	9	10	11+			
Sac Roe-North Peninsula																
Herendeen Bay	Weight	156.3	19 May - 14 June	-	148	144	175	218	248	310	362	404	411	177	550	
	Length			-	221	225	236	254	263	278	285	293	303			235
Deer Island-Mud Bay	Weight	167.0	19 May - 2 June	-	110	147	168	211	258	322	-	403	483	184	284	
	Length			-	210	230	241	256	268	283	-	299	321			242
Inner Port Moller Bay	Weight	158.4	29 May	-	134	153	177	222	283	272	312	396	302	194	87	
	Length			-	215	227	239	265	270	275	280	298	290			241
Outer Port Moller Bay	Weight	531.2	17 May - 4 June	57	131	141	162	191	263	284	331	326	433	164	678	
	Length			174	218	226	237	244	267	273	286	283	304			234
Bear River area	Weight	191.5	20 May - 4 June	-	-	124	165	-	227	292	-	-	-	139	38	
	Length			-	212	224	233	-	265	270	-	-	318			227
Cape Kutuzof	Weight	108.7	2 June	-	-	153	187	-	279	327	318	358	552	233	68	
	Length			-	-	232	247	-	273	286	278	287	325			257
Sac Roe-South Peninsula																
Stepovak Bay	Weight	19.3	9 June	-	163	208	257	298	306	301	-	-	-	282	53	
	Length			-	223	239	236	270	271	274	-	-	-			263
Balboa Bay	Weight	19.3	28 May	-	119	219	243	278	295	-	-	-	-	247	19	
	Length			-	208	244	256	262	270	-	-	-	-			253
Shumagin Islands	Weight	41.4	16 May	-	-	201	276	249	282	308	-	-	-	258	46	
	Length			-	-	243	255	260	264	272	-	-	-			259
Canoe Bay	Weight	77.5	29 May - 10 June	92	123	189	258	293	303	280	-	377	390	232	343	
	Length			192	204	230	252	265	267	261	-	279	300			244
Food and Bait-South Peninsula																
Otter Cove	Weight	161.4	19 August	-	150	191	207	247	236	-	-	-	179	192	350	
	Length			-	223	239	244	255	267	-	-	-	238			240

South Peninsula

The 1991 projected guideline herring harvest for the South Peninsula fisheries was 338 tons (Table 5), which did not include herring harvested in sections open for exploration (McCullough 1991). The General Sections of the Sand Point and King Cove Districts and the Seal Cape-Wosnesenski Section of the Pavlof District were open for exploration. The South Peninsula herring fisheries were open seven days a week through the closure of the sac roe season (July 15) except for the Canoe Bay Section, which closed on June 10 and reopened on June 29.

South Peninsula commercial herring catches from 1980 to 1990 were landed from May 9 to June 23 and in 1991 were landed from May 16 to June 11 (Table 1). Most catches have been taken during a time period of 20 days or less. In 1991, the commercial catch occurred in four locations: Stepovak Bay (19.3 tons), Shumagin Islands (41.4 tons), Balboa Bay (19.3 tons), and Canoe Bay (77.5 tons; Table 1). From May 16 to June 11, 157.4 tons were harvested by 10 purse seine permit holders making 26 deliveries. The average roe recovery was 9.66%, with an average price of \$400/ton for 10% roe recovery, making the ex-vessel estimated value of the fishery \$60,323.

The first ADF&G survey to document herring occurred on May 19 in Canoe Bay, where 23 tons were observed (Table 12). ADF&G surveys in Canoe Bay on May 22, May 29 and June 11 and in Balboa Bay on June 11 also documented the presence of herring. Commercial spotter pilots reported herring in Beaver Bay on May 20, the Shumagin Islands on May 26 and June 5. Most other surveys by ADF&G and commercial pilots were not successful in spotting herring.

By June 10, tender reports placed the Canoe Bay Section catch at 114 tons. The guideline harvest level was 94 tons, and the section was closed (Table 11). Several days later, when fish tickets were tabulated, the catch was actually 77.5 tons and the Canoe Bay Section was reopened on June 29, but no further harvests occurred. After all the fish tickets were tabulated, only the Swedania Point-Balboa Bay Section met the pre-season guideline harvest level with a catch of 19.3 tons.

Intensive aerial surveys to document spawning biomass and locations are not possible due to the large area, weather, muddy water, currently unpredictable appearance of herring, and the later portion of the fishery taking place during the beginning of the June sockeye salmon fishery when personnel are limited. Table 12 lists aerial surveys. In 1991, herring were visible in substantial numbers on two different surveys. There was not much commercial interest in the South Peninsula sac roe fishing in 1991. When commercial pilots surveyed the South Peninsula, poor survey conditions limited their efforts, and only a few 5 to 15 ton schools were observed in Balboa Bay and the Shumagin Islands.

The biomass of 411 tons observed in Canoe Bay on May 22 and the June 11 survey of 379 tons were used to estimate the spawning biomass of 790 tons. In Balboa Bay, on June 11 ADF&G observed 46 tons and the catch of 19.3 tons were used to determine the minimum spawning biomass of 65 tons. Biomass estimates for stocks other than Canoe were not possible. The harvest of 77.5 tons in Canoe Bay represents a 10% exploitation rate of the 790 ton minimum biomass estimate.

Table 11. South Peninsula commercial herring sac roe catch by area, day, and percent roe, 1991 (short tons).

Area	Date	Tons	Roe Percent
Stepovak Bay			
	May 28	4.2	10.00
	May 30	7.4	11.84
	June 1	2.8	7.70
	June 4	4.1	11.20
	June 9	0.8	9.10
	Total	19.3	10.59
Balboa Bay			
	May 20	6.8	11.50
	May 23	1.3	12.40
	May 25	2.4	9.20
	May 28	2.8	9.00
	June 5	6.1	13.30
	Total	19.3	11.49
Shumagin Islands			
	May 16	15.4	7.00
	May 25	5.3	7.50
	May 26	10.6	7.50
	June 5	10.1	11.20
	Total	41.4	8.22
Canoe Bay			
	May 30	1.8	5.90
	June 7	8.0	8.93
	June 9	64.9	10.06
	June 11	2.8	7.50
	Total	77.5	9.75
Total		157.4	9.66

Table 12. Alaska Department of Fish and Game South Peninsula aerial herring biomass surveys, 1991 (short tons).

Date	Stepovak Bay			Balboa Bay			Beaver Bay			Shumagin Islands			Canoe Bay		
	RAI/a	Tons/b	Rating/c	RAI/a	Tons/b	Rating/c	RAI/a	Tons/b	Rating/c	RAI/a	Tons/b	Rating/c	RAI/a	Tons/b	Rating/c
May 19													9	23	3
May 20	0	0	3					500	/d						
May 21	0	0	3	0	0	3	0	0	3						
May 22													159	411 /e	3
May 23	0	0	3	0	0	3	0	0	3						
May 25	1	2 /e	3	0	0	3	0	0	3						
May 26											15 /d,e				
May 29													12	31	3
June 5					5 /d						15 /d,e				
June 10														250 /d	
June 11				18	46 /e	3	0	0	3				150	379 /e	3
June 29														125 /d	
Total Biomass	2			46			0			30			790		

-30-

-Continued-

Table 12. (page 2 of 2)

RAI units express the surface area of herring schools in terms of small schools (surface area equal to 532 square feet). For example, 10 RAI units are equivalent to 10 small herring schools, each with a surface area of 538 square feet.

a/ Relative Abundance Index (RAI): small school (less than 538 square feet) = 1 RAI unit
medium school (532 square feet to 4,841 square feet) = 5 RAI units
large school (square feet/538 square feet)

b/ Tons: RAI units are multiplied by 1.52 (schools in water less than 16 feet of depth)
RAI units are multiplied by 2.58 (schools in water 16 to 26 feet of depth)

c/ Rating of survey: (1) Excellent, (2) Good, (3) Fair, (4) Poor, (5) Unsatisfactory

/d Commercial pilot report.

/e Used in calculating biomass estimate

The Stepovak Bay, Balboa Bay, and Shumagin Islands fisheries were dominated by age 6 and age 7 herring (Table 13, 14, Figure 8). The Canoe Bay fishery was dominated by age 3 and age 6 herring. The amount of age 3 herring in Balboa and Canoe Bays should produce substantial catches of age 4 herring in 1992.

Table 10 lists the South Peninsula herring sac roe average weights and lengths of herring samples by age group. Herring harvested in Stepovak Bay averaged the largest (282 g and 263 mm) and herring harvested in Canoe Bay averaged the smallest (232 g and 244 mm).

No juvenile herring schools nor spawning were observed by ADF&G personnel nor were any reports of the occurrence of juvenile herring or spawning reported by commercial fishermen or pilots in South Peninsula waters.

FOOD AND BAIT FISHERY

North Peninsula

There has never been a reported food and bait herring delivery from the North Peninsula area. In 1991, the North Peninsula food and bait fishery season was closed for the season. The reasons for a complete closure were: (1) the exploitation rate of the observed spawning biomass in the Port Moller District was 16% during the sac roe season; (2) no local stocks were reported from other districts; (3) there has never been a documented North Peninsula herring harvest during the food and bait season; and (4) concerns have been expressed about the potential of this fishery harvesting stocks other than those from the North Peninsula during the food and bait season. North Peninsula coastal waters are the likely migration route of spent Togiak and perhaps other Bering Sea stocks from their spawning grounds to summer and fall feeding grounds in the Aleutian Islands.

South Peninsula

In 1982, the South Peninsula food and bait herring fishery produced 565 tons (Table 4), all of which were taken from the Stepovak Bay Section. The harvest was by one vessel making 11 landings with the aid of four different tenders over a 60 day period. In 1982, 2 or 3 different vessels actively explored throughout the South Peninsula, but only 1 vessel made deliveries during October and November. In 1983, the South Peninsula sac roe fishery was closed and all herring were allocated to a food and bait fishery. Six vessels explored throughout the South Peninsula from late September through mid March but made no deliveries. In 1984, the South Peninsula sac roe season was reestablished. In 1985, the current South Peninsula harvest strategy of allowing 75% of the available harvest to be taken as sac roe with the remaining 25% reserved for a food and bait fishery was established.

To date in 1991, the South Peninsula food and bait herring fishery produced 161.4 tons (Table 4). Two purse seine permit holders made four deliveries to one

Table 13. Estimated age composition of South Peninsula commercial herring sac roe catches by area and percent, 1985-91.

Year	-----Ages-----									
	2	3	4	5	6	7	8	9	10	11
Stepovak Bay										
1985	No samples									
1986	No catch									
1987	No catch									
1988	0	5	78	17	0	0	1	0	0	0
1989	0	3	31	50	13	0	0	0	2	0
1990	1	6	8	28	50	7	1	0	1	1
1991 /a	0	4	13	6	23	42	13	0	0	0
Balboa										
1988	0	32	50	9	0	1	3	1	2	3
1989	No samples									
1990	0	4	7	22	59	4	0	4	0	0
1991	0	16	11	16	26	32	0	0	0	0
Shumagin Islands										
1989	0	1	15	79	1	0	0	3	0	2
1990	0	4	0	26	67	2	0	0	0	1
1991	0	0	17	2	30	48	2	0	0	0
Canoe Bay										
1985	0	1	3	81	7	6	1	1	0	1
1986	0	6	0	3	82	6	2	0	1	0
1987	0	25	28	1	5	34	3	3	0	0
1988	0	24	31	20	0	1	16	4	2	1
1989	0	6	56	22	9	0	0	5	1	1
1990	0	23	5	49	17	5	0	0	1	0
1991	0	27	16	1	41	12	2	0	1	0
Pavlof Bay										
1985	No samples									
1986	No samples									
1987	0	6	18	5	11	48	9	2	1	0
1988	0	34	50	5	0	2	7	0	2	0
1989	No samples									
1990	No catch									
1991	No catch									
Leonard Harbor										
1986	0	3	0	3	83	7	4	0	0	0
1987	0	67	5	0	3	25	0	0	0	0
1988	No samples									
1989	No samples									
1990	0	3	2	35	46	6	0	3	6	0
1991	No catch									

/a 1991 Stepovak Bay catch was in the Northeastern portion of the bay.

Table 14. Estimated age composition of South Peninsula commercial herring sac roe purse seine catches by area and day, 1991.

Date	Sample Size	Ages									
		2	3	4	5	6	7	8	9	10	11
Stepovak Bay /a											
June 9	53	0.0	3.8	13.2	5.7	22.6	41.5	13.2	0.0	0.0	0.0
Total	53	0.0	3.8	13.2	5.7	22.6	41.5	13.2	0.0	0.0	0.0
Balboa Bay											
May 28	19	0.0	15.8	10.5	15.8	26.3	31.6	0.0	0.0	0.0	0.0
Total	19	0.0	15.8	10.5	15.8	26.3	31.6	0.0	0.0	0.0	0.0
Shumagin Islands											
May 16	46	0.0	0.0	17.4	2.2	30.4	47.8	2.2	0.0	0.0	0.0
Total	46	0.0	0.0	17.4	2.2	30.4	47.8	2.2	0.0	0.0	0.0
Canoe Bay											
May 29	113	0.9	47.8	36.3	1.8	5.3	7.1	0.9	0.0	0.0	0.0
June 4	48	0.0	29.2	2.1	0.0	45.8	20.8	0.0	0.0	2.1	0.0
June 6	80	0.0	21.3	11.3	1.3	51.3	12.5	1.3	0.0	1.3	0.0
June 8	51	0.0	2.0	5.9	2.0	78.4	5.9	3.9	0.0	2.0	0.0
June 10	51	0.0	9.8	2.0	0.0	62.7	19.6	3.9	0.0	0.0	2.0
Total	343	0.3	26.5	16.0	1.2	41.1	12.0	1.7	0.0	0.9	0.3

/a 1991 Stepovak Bay catch was in the Northeastern portion of the bay.

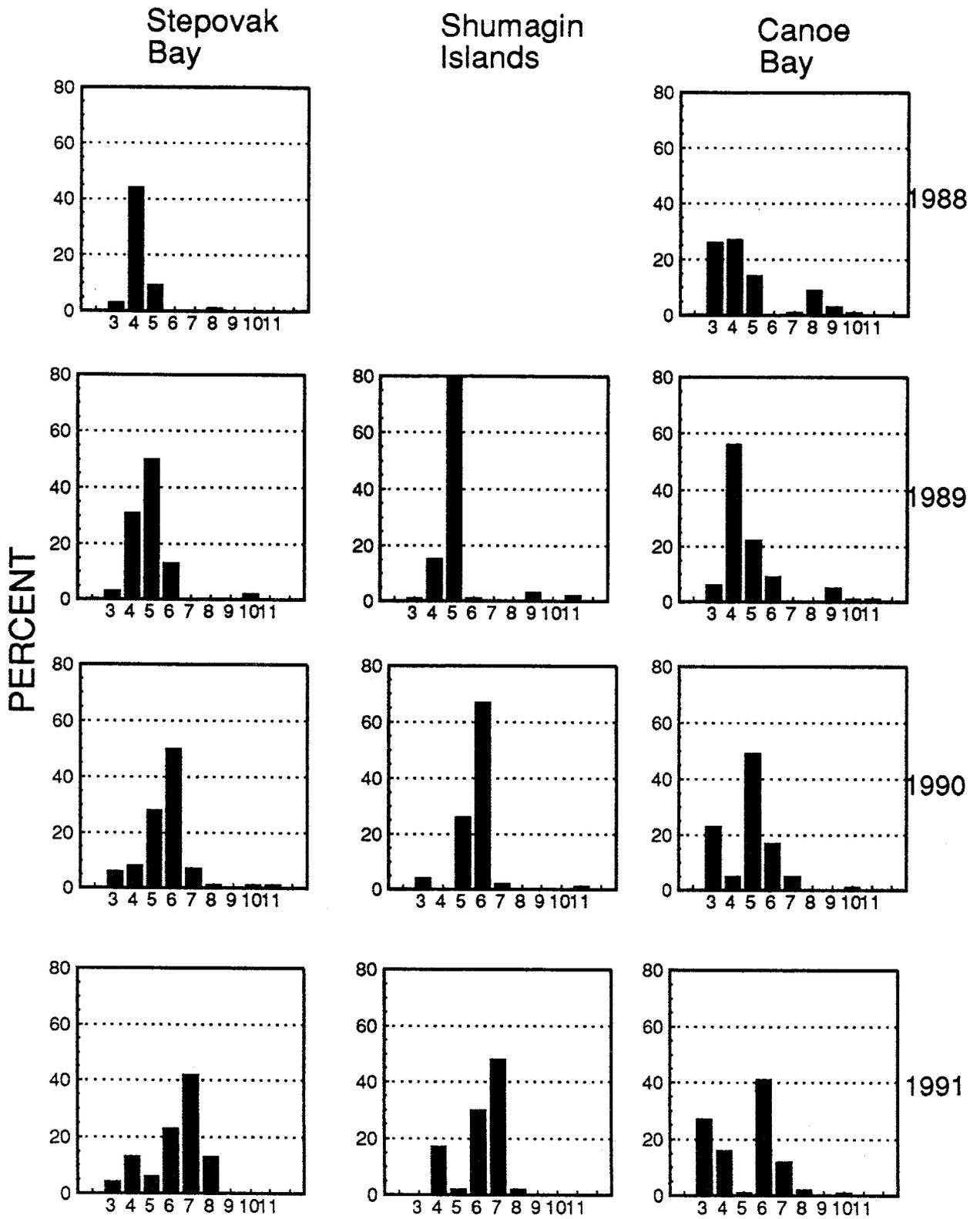


Figure 8. Age distribution of annual herring sac roe catches from Stepovak Bay, Shumagin Islands, and Canoe Bay, 1988-91.

company that purchased herring during the food and bait season. All of the herring were harvested from the General Section of the King Cove District.

Table 10 lists the South Peninsula herring food and bait average weights and lengths of herring samples by age group. The herring averaged 192 g and 240 mm in length (Figure 9). Most of the Otter Cove herring were age 4 (87.2%, Table 15).

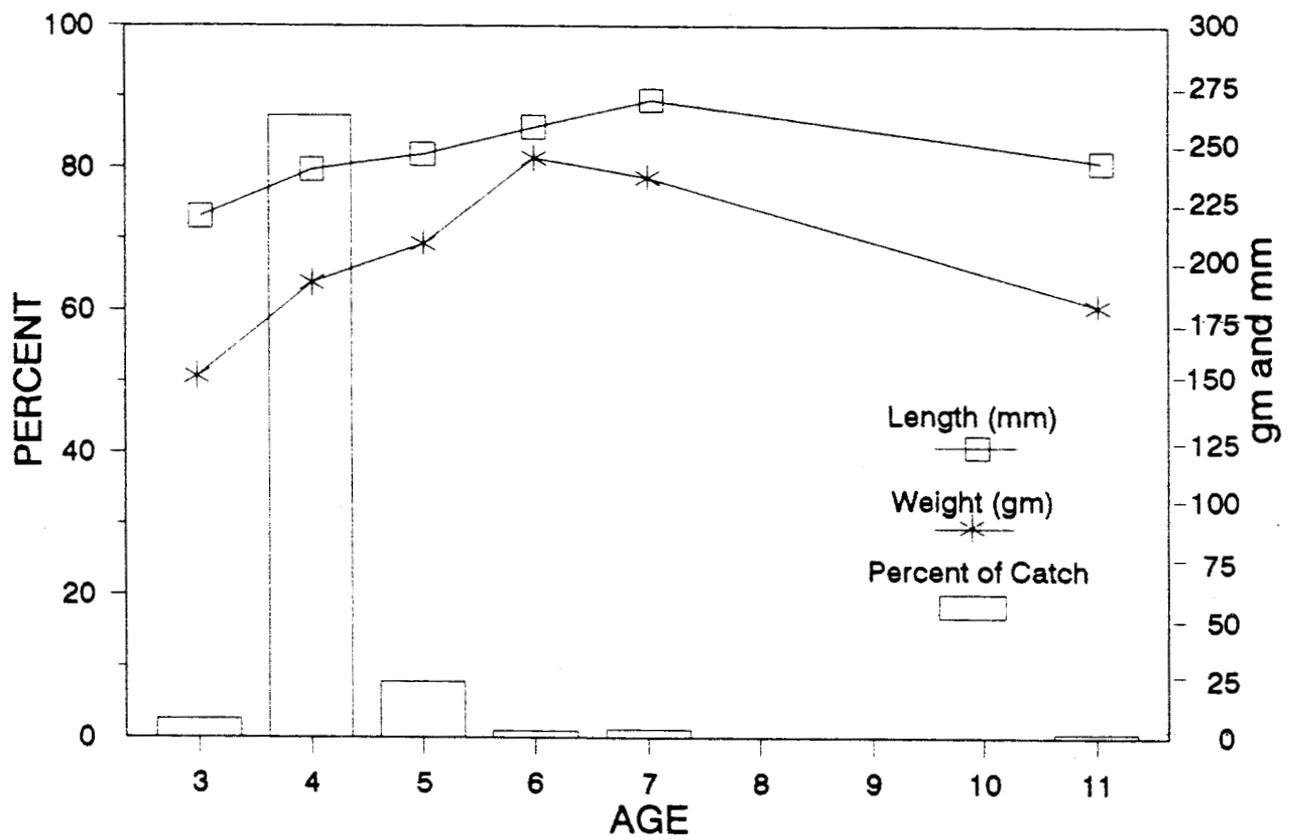


Figure 9. Length (mm), weight (gm), and age distribution of annual commercial herring food and bait catches from the South Peninsula, 1991.

Table 15. Estimated age composition of South Peninsula commercial herring food and bait catches by area and percent, 1991.

Date	Sample Size	Ages								
		3	4	5	6	7	8	9	10	11
King Cove District										
August 19	351	2.6	87.2	7.7	0.9	1.1	0.0	0.0	0.0	0.6

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