(2)

AGENDA D-2
DECEMBER 1982

M E M O R A N D U M

TO: Council, SSC, and AP members

FROM: Jim H. Branson
Executive Director

DATE: November 30, 1982

SUBJECT: Bering/Chukchi Sea Herring FMP

ACTION REQUIRED

(a) Final approval of FMP revisions.
(b) Report on status of stocks and stock separation study.
(c) Review proposals to Board relevant to FMP.

BACKGROUND

At the July 1982 meeting the Council withdrew the Herring FMP from Secretarial review. Revisions were incorporated with a strong emphasis on reducing the likelihood of overfishing and eliminating directed foreign fishing for herring. A revision package was distributed to Council family for tentative approval in September, and the package was then sent to the entire herring mailing list. A public hearing, attended by Rudy Petersen, Leroy Sowl and Clarence Pautzke, was held in Bethel on November 11. A summary of the hearing and a resolution passed by the Association of Village Council Presidents Fisheries Task Force are included here as agenda item D-2(c). The Council has agreed to accept public testimony on the revisions until final action is taken at the December meeting.

General Summary of the FMP

The Bering/Chukchi Sea Herring FMP established the management objectives and regulatory intent for directed herring fisheries in the FCZ. The FMP states that U.S. fishermen are capable of harvesting the entire OY and have expressed the desire and intent to do so. The FMP recognizes the priority of inshore fisheries, which are primarily for roe, and allows a harvest of only that portion of the Acceptable Biological Catch (ABC) remaining after the roe fisheries are completed. Although the ABC is determined by a conservative formula which gives a low exploitation rate in most cases, the remaining ABC is reduced by half to further address the concerns about impacting subsistence and other important stocks.

A summer fishery in the Aleutians is allowed by the FMP. This fishery will occur from July 1 through September 30 south of 55°47'N and is limited to 2,000 mt. When 2,000 mt has been taken, whether in state waters, the FCZ, or a combination, the FCZ automatically closes. The area will reopen if a winter fishery is allowed, which may occur on October 1.

The winter fishery portion of OY is determined by the revised OY formula mentioned above. After ABC is calculated, all previous herring harvests during the fishing year (roe and food/bait) and AIC are subtracted. The remainder is divided by two, and if this amount is greater than 2,000 mt a winter fishery will occur. The winter harvest may not exceed 10,000 mt, however.

No directed herring fishing by foreign nations is allowed under this FMP. However, an incidental catch (AIC) in the groundfish fisheries is allowed. This AIC is limited to 0.1% of the annual groundfish allocation for each nation (including the U.S.). AIC becomes part of the groundfish OY as stated in the Bering Sea/Aleutian Islands Groundfish FMP. When a nation reaches its AIC it is automatically excluded from the Herring Savings Area, a large area of the Bering Sea where herring concentrate during the winter months. At that time herring also becomes a prohibited species to all fishermen and vessels of that nation. The total AIC is not expected to exceed 2,000 mt.

It is the stated intent of the FMP to establish a cooperative management policy of the Council, the Board of Fisheries, and NMFS and ensure that federal offshore and state inshore herring management regimes complement each other. The offshore fisheries will be managed to reduce their impact on the inshore fisheries without unnecessary disruption or restriction of offshore groundfish and herring fishing operations.

Status of Stocks and Stock Separation Study

In 1982, the harvest of herring in the eastern Bering Sea Commercial Fishing Districts totalled 24,897 mt. An additional 2,939 mt was taken off Unalaska Island. Subsistence fisheries harvested on additional 97 mt. Reports by ADF&G on the 1982 fisheries, status of stocks, and age, sex, and size composition of eastern Bering Sea stocks are available as agenda items D-2(a) and (b). Additional presentations will be made by ADF&G and NMFS staff at the Council/Board meeting.

Preliminary results are available for a stock separation study contracted by ADF&G to the Fisheries Research Institute at the University of Washington. ADF&G staff will give a brief report on the findings to date.

Proposals to the Board of Fisheries

Two proposals to the Board concern the areas outside three miles covered by the FMP:

Proposal #118: Would allow herring to be taken in the Bering Sea north of 55°47'N by trawls during seasons established by emergency order (p. 60 of proposal packet; proposed by ADF&G staff).

Proposal #168: Would eliminate use of trawls in the South Peninsula-Aleutian Islands herring fishery for food and bait between April 15 and July 15 (p. 84; proposed by Emil Berikoff).

PACIFIC HERRING STOCKS AND FISHERIES IN THE EASTERN BERING SEA, ALASKA, 1982

A Report to the North Pacific Fisheries Management Council

November 1982

Prepared by:

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Craig Whitmore,
and
Daniel Bergstrom

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Division of Commercial Fisheries
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This report summarizes current information on eastern Bering Sea Pacific herring stocks and fisheries within Alaskan waters. A more detailed account of this information is presented in Fried et al (1982).

COMMERCIAL FISHERIES

A total of 24,897 m.t. of Pacific herring were harvested in eastern Bering Sea Commercial Fishing Districts during 1982 (Figures 1 and 2, Table 1). This was the largest total harvest recorded since these fisheries began in the 1960's. Exploitation of estimated available spawning biomass was 21.5% (Table 2). Wastage of herring was estimated to be less than 500 m.t. for all Districts combined. Most documented wastage was due to storms and vessel mishaps rather than to dumping of unwanted herring. Numbers of buyers and fishermen increased in Togiak District, but decreased in all other Districts (Table 3). Spawn on kelp harvests in Togiak and Norton Sound Districts totaled 141.4 m.t. (Table 4). Value of total herring and spawn on kelp harvests to fishermen was estimated to be $7.9 million.

A total of 2,939 m.t. of herring was also harvested in the vicinity of Unalaska Island during 1982 (Table 1). Studies are currently underway to determine whether herring harvested during this fishery belong to stocks which spawn and are harvested in Togiak, Security Cove or Goodnews Bay Districts.

SUBSISTENCE FISHERIES

A total of 97 m.t. of Pacific herring were harvested by 129 families from seven villages in the Nelson Island and Yukon-Kuskokwin Delta area (Table 5).

STOCK ASSESSMENT

Methods

Aerial surveys were conducted within all Fishing Districts, except Cape Romanzof, to determine relative abundance, distribution and estimated biomass of herring schools. Basic methods of data collection were similar to those used in previous years (Barton and Steinhoff 1980). A total of 172 hours was spent in aerial assessment of herring spawning stocks: 63 hours in Togiak, 28 hours in Security Cove/Goodnews Bay, 6 hours in Nelson Island and 75 hours in Norton Sound. In-season stock size estimates could only be made for Togiak and Norton Sound Districts due to weather and water conditions. Post-season estimates were made for the remaining Districts based upon catch rates and spawn deposition during the season (Table 6).

Availability of a chartered helicopter on the Togaik fishing grounds greatly aided test fishing, catch sampling, fishery monitoring and assessment activities. Unfortunately, mechanical failures prevented use of the helicopter during most of the time period chartered purse seine vessels were available; tonnage data on only one herring school was obtained during the season (Table 7). Conversion factors of 1.2 (water depth 5 m or less), 2.5 (water depth greater than 5 m) and 3.0 (water depth greater than 8 m) per 50 m^2 school surface area were used in analysis of Togiak District aerial survey data. Conversion factors of 2.4 or 3.1 m.t./50 m^2 were used for all other Districts.

Test fishing with variable mesh gillnets and sampling of commercial landings were conducted in all Fishing Districts to determine age, size and sexual maturity of herring. Additionally, chartered purse seine vessels were used to collect herring samples within Togiak District. A total of 10,739 herring was sampled during 1982.

Results

Spawning populations in most Districts were lower than those observed in 1981 (Table 6). A total of 119,600 m.t. of herring was estimated to have been present during the 1982 spawning season. Spawn deposition was similar to that observed in 1981, with totals of 66, 8 and 37 linear km of milt sighted during aerial surveys in Togiak, Security Cove and Norton Sound Districts, respectively. Age composition analyses indicated that five year old herring (1977 year class) comprised 55% of the total spawning population (Figures 3 and 4). Four year old herring (1978 year class) comprised 18% of the spawning population.

Peak periods of herring abundance occurred 19-23 May in Togiak District, 25-30 May in Security Cove and Goodnews Bay Districts, and 6-14 June in the various Subdistricts of Norton Sound District. Ice and cold water temperatures delayed inshore migration and onset of spawning as compared to 1980 and 1981 in all Districts.

OUTLOOK FOR 1983

Based upon a moderate recruitment of four year old herring and the continued large returns of five year old herring in 1982, the Department of Fish and Game anticipates a harvestable surplus of herring to be available in all Districts in 1983. However, since no methods are available to reliably forecast actual returns (or to estimate recruitment), harvest levels will be adjusted during the season according to observed herring biomass. If it is not possible to determine herring abundance by using aerial surveys, stock condition will be assessed using information from test and commercial catches along with spawn deposition observations.

Although increased use of collected fishery statistics in mathematical models may provide useful information for predicting abundance trends of herring populations, further work is needed to refine real time stock assessment techniques. Offshore hydroacoustic and trawl surveys coupled with stock identification studies could provide pre-season stock size estimates. Underwater telemetry or tagging studies could provide needed information on herring movement patterns and spawning ground residence time to refine in-season stock size estimates. Inshore hydroacoustic surveys could provide a more cost effective method of obtaining conversion factor estimates than using chartered purse seine vessels.

LITERATURE CITED

Barton, L.H. and D.L. Steinhoff. 1980. Assessment of spawning herring (Clupea harengus pallasi) stocks at selected coastal areas in the eastern Bering Sea. Alaska Department of Fish and Game Informational Leaflet No. 187. 60 p.

Fried, S.M., C. Whitmore and D. Bergstrom. 1982. Pacific herring stocks and fisheries in the eastern Bering Sea, Alaska, 1982: A report to the Alaska Board of Fisheries. Alaska Department of Fish and Game mimeo. 30 p.

Table 1. Herring and herring spawn on kelp harvests in metric tons by U.S. commercial fishermen in the eastern Bering Sea, Alaska 1909-1982.

Year	Herring 1/						Herring Spawn on Kelp		
	Unalaska Island	Bristol Bay	Security Cove/ Goodnews Bay	Cape Romanzof	Norton Sound	Total	Bristol Bay	Norton Sound	Total
1909-1916	-	-	-	-	2/	2/	-	-	-
1916-1928	-	-	-	-	1,705.6	1,705.6 3/	-	-	-
1929	1,141.9	-	-	-	151.3	1,293.2	-	-	-
1930	1,738.2	-	-	-	399.7	2,137.9	-	-	-
1931	957.9	-	-	-	78.2	1,036.1	-	-	-
1932	2,726.9	-	-	-	480.0	2,756.9	-	-	-
1933	1,438.2	-	-	-	27.8	1,466.0	-	-	-
1934	1,390.9	-	-	-	3.5	1,394.4	-	-	-
1935	2,188.0	-	-	-	14.1	2,202.1	-	-	-
1936	1,251.1	-	-	-	-	1,251.1	-	-	-
1937	525.4	-	-	-	5.0	530.4	-	-	-
1938	465.5	-	-	-	9.0	474.5	-	-	-
1939	-	-	-	-	5.0	5.0	-	-	-
1940	-	-	-	-	12.7	12.7	-	-	-
1941	-	-	-	-	3.4	3.4	-	-	-
1942-1944	-	-	-	-	-	-	-	-	-
1945	68.0	-	-	-	-	68.0	-	-	-
1946	-	-	-	-	-	-	-	-	-
1947-1963	No Commercial Operations Reported								
1964	-	-	-	-	18.1	18.1	-	-	-
1965	No Commercial Operations Reported								
1966	-	-	-	-	10.8	10.8	-	-	-
1967	-	122.0	-	-	-	122.0	-	-	-
1968	-	82.4	-	-	-	82.4	24.8	-	24.8
1969	-	42.8	-	-	2.0	44.8	4.6	-	4.6
1970	-	25.0	-	-	7.3	32.3	17.6	-	17.6
1971	-	-	-	-	17.7	17.7	23.5	-	23.5
1972	-	73.7	-	-	15.3	89.0	29.1	-	29.1
1973	-	46.3	-	-	32.3	78.6	5.3	-	5.3
1974	-	111.7	-	-	2.4	114.1	57.0	-	57.0
1975	-	50.4	-	-	-	50.4	50.4	-	50.4
1976	-	-	-	-	7.7	7.7	134.1	-	134.1
1977	-	2,534.9	-	-	9.5	2,545.4	125.1	Trace	125.1
1978	-	7,030.4	259.0	-	13.6	7,303.0	149.6	3.4	153.0
1979	-	10,115.3	466.0	-	1,173.0	11,754.3	188.0	11.8	199.8
1980	-	17,774.0 4/	1,039.0	554.0	2,215.4	21,600.3	86.0	22.2	108.2
1981	639	11,374.3	1,660.2	653.2	3,964.5	18,291.2	171.9	37.2 6/	209.1
1982 5/	2,939	19,556.0	1,178.0	596.0	3,567.0	27,836.0	106.5	34.9	141.4

1/ Prior to 1964 majority of herring catch was taken in summer and fall for food market; since 1964 majority of herring catch was taken in spring primarily for marketing of roe.
2/ Fishery occurred some years, but harvests unavailable.
3/ Total catch for all years.
4/ There was an additional estimated 5,200 m.t. of wastage.
5/ Preliminary data.
6/ Does not include 5 m.t. dumped (unmarketable or no market when harvested).

Table 2. Estimated biomass and commercial harvest of Pacific herring in eastern Bering Sea fishing Districts, Alaska, 1978-1982.

District		Biomass (m.t.)	Harvest (m.t.)	Roe %	Estimated Value (dollars)	% Biomass Harvested
1982						
	Togiak	88,800	19,556	8.8	6,174,300	22.0
	Security Cove	4,600	737	9.3	271,000	16.0
	Goodnews Bay	2,400	441	9.5	187,900	18.4
	Cape Romanzof	4,400	596	9.3	221,700	13.6
	Norton Sound	15,800	3,567	8.8	1,046,200	22.6
	Total	116,000	24,897	8.9	7,630,100	21.5
1981						
	Togiak	143,900	11,374	9.1	3,988,000	7.9
	Security Cove	7,500	1,064	8.1	347,070	14.2
	Goodnews Bay	3,900	596	7.7	196,170	15.3
	Cape Romanzof	4,400	653	8.0	211,260	15.0
	Norton Sound	22,800	3,965	8.8	1,500,000	17.3
	Total	182,500	17,652	8.9	6,242,500	9.7
1980						
	Togiak	62,300	17,774 1/	9.2	3,205,000	28.5
	Security Cove	1,100	632	8.2	151,000	57.4
	Goodnews Bay	1,100	406	9.5	97,000	36.9
	Cape Romanzof	2,700	554	9.8	132,000	20.5
	Norton Sound	7,600	2,224	8.1	500,500	29.3
	Total	74,800	21,590	8.8	4,085,500	28.9
1979						
	Togiak	216,800	10,115	8.6	6,700,000	4.7
	Security Cove	19,500	385	8.5	327,000	2.0
	Goodnews Bay	6,700	82	4.7	38,500	1.2
	Cape Romanzof	2,700	0	-	-	0.0
	Norton Sound	7,000	1,172	7.0	628,200	16.7
	Total	252,700	12,406	8.0	7,694,000	4.9
1978						
	Togiak	172,600	7,033	8.2	2,300,000	4.1
	Security Cove	1,200	259	-	-	21.6
	Goodnews Bay	400	0	-	-	0.0
	Cape Romanzof	2,700	0	-	-	0.0
	Norton Sound	4,800	13	-	-	0.3
	Totals	181,700	7,305	8.2	2,300,000	4.0

1/ Does not include an estimated 5,200 m.t. of waste.

Table 3. Commercial harvest of Pacific herring spawn on rockweek kelp in eastern Bering Sea Fishing District, Alaska, 1978-1982.

	District	Harvest (m.t.)	Number of Buyers	Number of Pickers	Estimated Value (Dollars)
1982					
	Togiak	106.5	8	214	176,193
	Norton Sound	34.9	1	74	57,585
	Total	141.4			233,778
1981					
	Togiak	171.9	7	108	250,000
	Norton Sound	37.2 1/	4	22	45,000 2/
	Total	209.1			295,000
1980					
	Togiak	86.0	21	78	94,600
	Norton Sound	22.2	1	20	73,000
	Total	108.2			167.600
1979					
	Togiak	188.0	16	100	248,160
	Norton Sound	11.8	1	19	15,576
	Total	199.8			263,736
1978					
	Togiak	149.6	11	160	119,800
	Norton Sound	3.4	1	0	2,723
	Total	153.0			122,523

1/ Does not include 5 m.t. dumped.
2/ Only 14 m.t. marketed, rest lost during tender accident.

Table 4. Numbers of buyers and fishermen participating in eastern Bering Sea Pacific herring fisheries, Alaska, 1978-1982.

			Number of Fishermen 1/	
	District	Number of Buyers	Gillnet	Purse Seine
1982				
	Togiak	33	200	135
	Security Cove	3	107	*
	Goodnews Bay	3	84	*
	Cape Romanzof	2	75	*
	Norton Sound	7	237	*
1981				
	Togiak	28	106	83
	Security Cove	7	113	*
	Goodnews Bay	5	175	*
	Cape Romanzof	4	111	*
	Norton Sound	13	332	*
1980				
	Togiak	27	363	140
	Security Cove	8	175	*
	Goodnews Bay	4	165	*
	Cape Romanzof	2	69	*
	Norton Sound	8	294	*
1979				
	Togiak	33	350	175
	Security Cove	2	61	*
	Goodnews Bay	1	41	*
	Cape Romanzof		No Fishery Conducted	
	Norton Sound	7	50	17
1978				
	Togiak	16	40	25
	Security Cove	3	-	-
	Norton Sound	1	11	-

** Purse seine gear prohibited.

1/ Refers to # of vessels enumerated during aerial surveys in Togiak District.

Table 5. Subsistence herring catch (in metric tons) and effort data by selected areas, eastern Bering Sea, Alaska, 1975-1982. 1/

Village	1975	1976	1977	1978	1979	1980	1981	1982
				Nelson Island				
Tununak	19.8	13.9	51.9	34.6	31.0	59.2	36.0	43.8
Umkumiut	30.0	8.5	2.8	10.4	7.5	3.1	9.0	0
Toksook Bay	31.0	31.8	19.3	33.5	46.5	26.6	13.0	31.6
Total	80.8	61.2	74.0	78.5	85.0	88.9	58.0	75.4
Number of Fishing Familes	109	42	90	83	54	70	93	65
				Yukon-Kuskokwim Delta				
Scammon Bay	-	0.6	-	0.6	5.4	2.8	6.9	3.5
Chevak	-	0.6	0.1	-	2.1	3.2	1.7	1.8
Hooper Bay	2.5	2.7	2.1	3.5	2.8	3.3	3.6	4.2
Kwigillingok	-	9.6	0.9	-	7.2	12.0	-	12.0 2/
Total	2.5	13.5	3.1	4.1	17.5	21.3	12.2	21.5
Number of Fishing Families	34	49	39	29	106	80	45	64
				Areas Combined				
Total Catch	83.3	74.7	77.1	82.6	102.5	110.2	70.2	96.9
Number of Fishing Families	143	91	129	112	160	150	138	129

1/ Other areas with small catches have been surveyed irregularly (1975-1978 estimated total coastal yearly subsistence catch averaged 100 m.t.).

2/ Estimate based on post season observations.

Table 6. Relative abundance index (RAI) and estimated biomass of eastern Bering Sea herring, Alaska, 1978-1982.

District	1978	1979	1980	1981	1982
			Relative Abundance Index (RAI) 1/		
Togiak	43,050	137,630	15,249	79,352	49,998
Security Cove	246	2,912	435	2,228	486 3/
Goodnews Bay	241	3,729	3/	1,593	3/
Nelson Island	1,079	3/	3/	1,072	3/
Cape Romanzof	539	3/	3/	4/	4/
Norton Sound	1,277	1,860	2,242	6,516	4,548
Total	46,432	146,131+	17,926+	90,761+	55,032+
			Estimated Biomass in m.t. 2/		
Togiak	172,600	216,800	62,300	143,900	88,800
Security Cove	1,200	19,500	1,100	7,500	4,600 3/
Goodnews Bay	400	6,700 3/	1,100 3/	3,900	2,400 3/
Nelson Island	5,400	5,400 3/	5,400 3/	3,600	3,600 3/
Cape Romanzof	2,700	2,700 3/	2,700 3/	4,400 4/	4,400 4/
Norton Sound	4,800	7,000	7,600	20,800	15,800
Total	187,100	258,100	80,200	186,100	119,600

1/ Number of fish schools equivalent to 50 m surface area, unadjusted for presence of non-herring pelagic species.

2/ Adjusted for presence of non-herring pelagic species. Estimates for 1978 and 1979 represent low end of estimate ranges from Barton and Steinhoff (1980), 1980 estimates from Kingsbury (1980).

3/ Incomplete data due to inclement weathern and/or turbid waters, biomass estimates are questionable and are based on 1978, 1979 or 1981 data.

4/ No aerial surveys made, 1981 estimate based upon assumption that commercial harvest represented 15 percent of total biomass; 1981 estimate used for 1982.

Table 7. Conversion estimates (metric tons of Pacific herring per 50 m^2 school surface area) obtained from test purse seine fishing, Togiak District, Alaska, 1978-1982.

Year	Water Depth (m)	Biomass per RAI unit	(m.t./50 m)
1981	2	1.1	Catch Landed
1980	3	1.2	Catch Landed
1980	5	1.1	Catch Landed
1980	5	1.2	Catch Estimated in Net
1979	6	2.4	Catch Landed
1980	6	3.0	Catch Estimated in Net
1980	6	2.6	Catch Estimated in Net
1981	6	1.7	Catch Landed
1980	8	1.6	Catch Estimated in Net
1981	8	4.0	Catch Landed
1982	8	1.9	Catch Estimated in Net
1978	?	6.7	Catch Estimated in Net
1978	?	11.0	Catch Estimated in Net

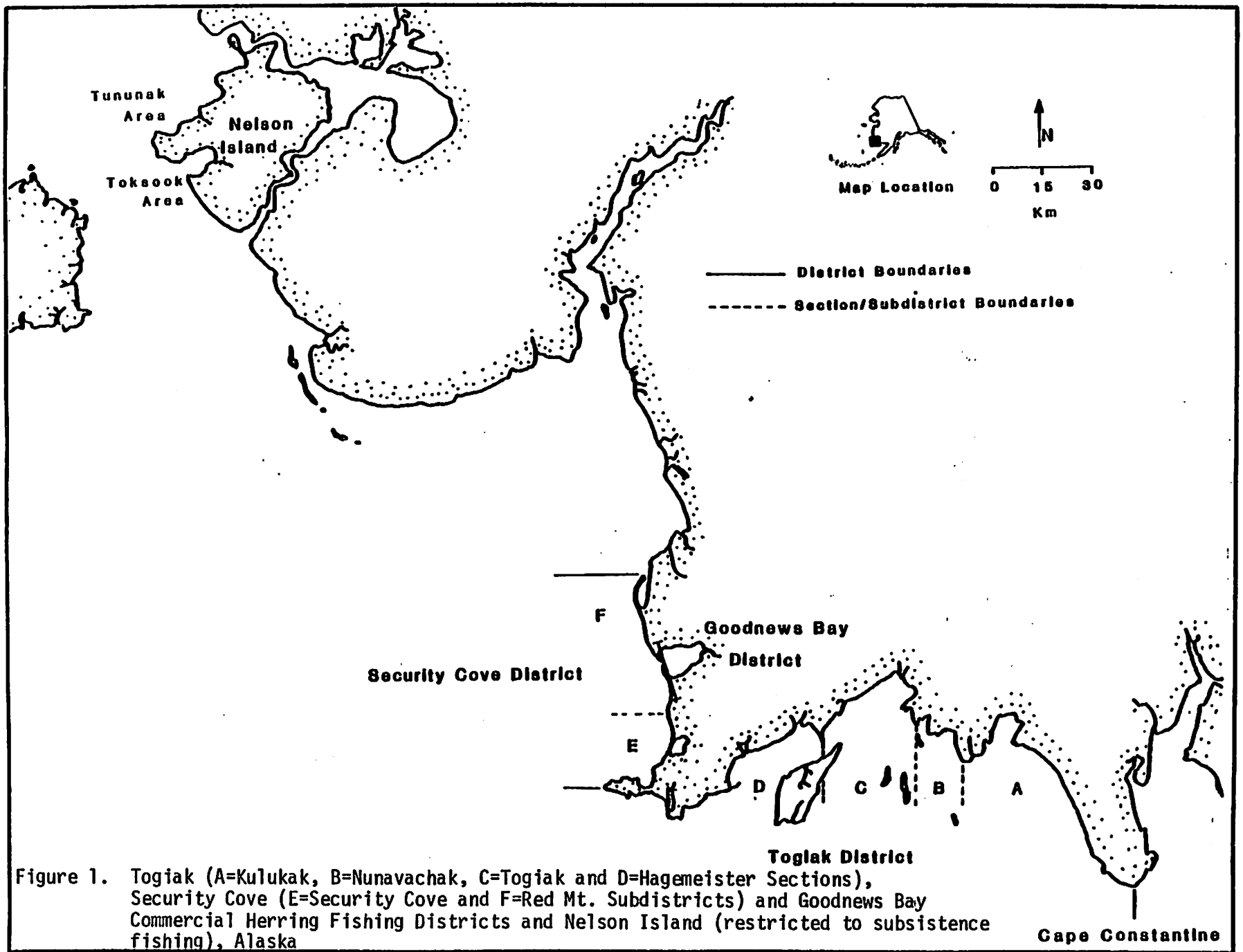

Figure 1. Togiak (A=Kulukak, B=Nunavachak, C=Togiak and D=Hagemeister Sections), Security Cove (E=Security Cove and F=Red Mt. Subdistricts) and Goodnews Bay Commercial Herring Fishing Districts and Nelson Island (restricted to subsistence fishing), Alaska

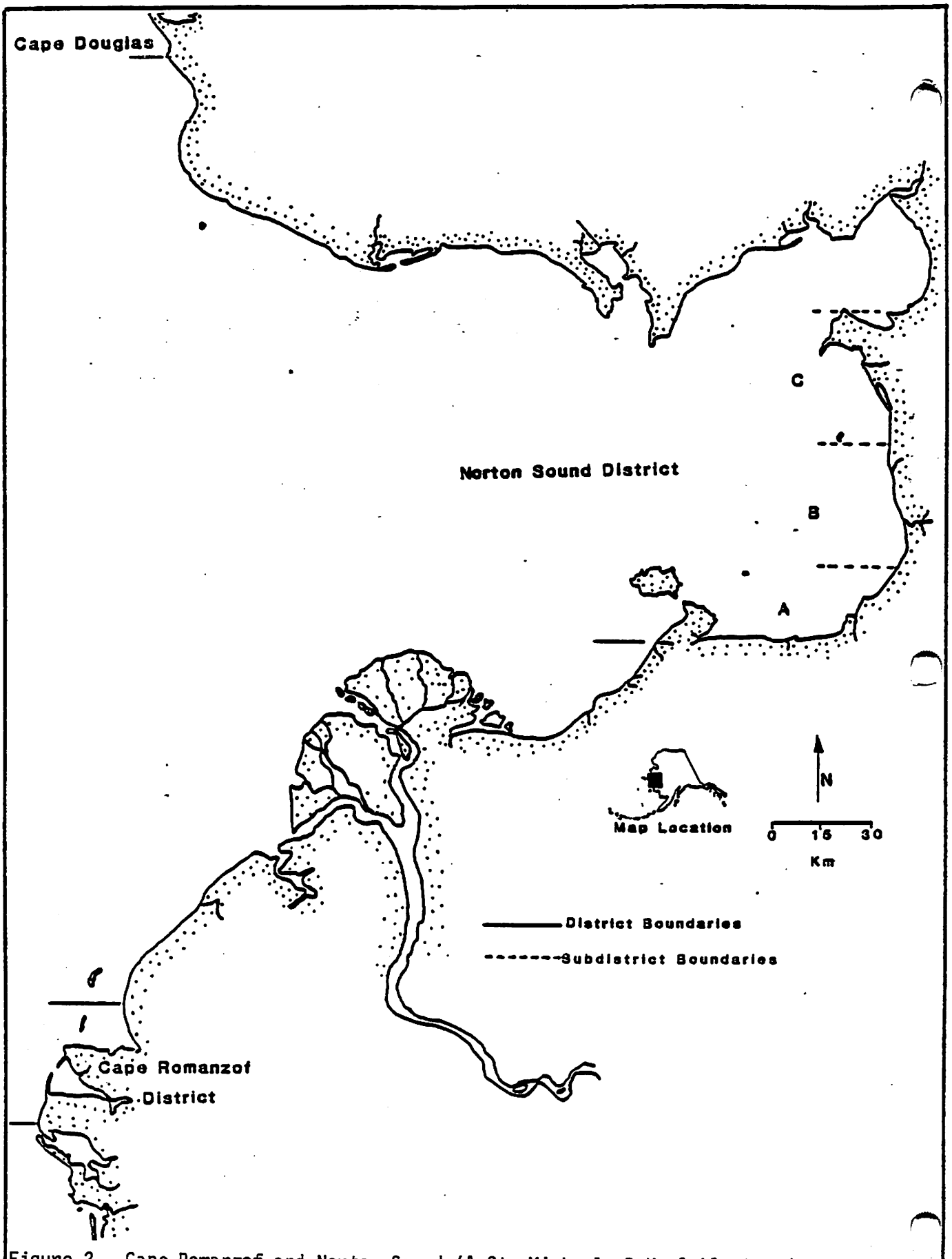

Figure 2. Cape Romanzof and Norton Sound (A=St. Michael, B=Unalakleet and C=Cape Denbigh Subdistricts) Commercial Herring Fishing Districts, Alaska

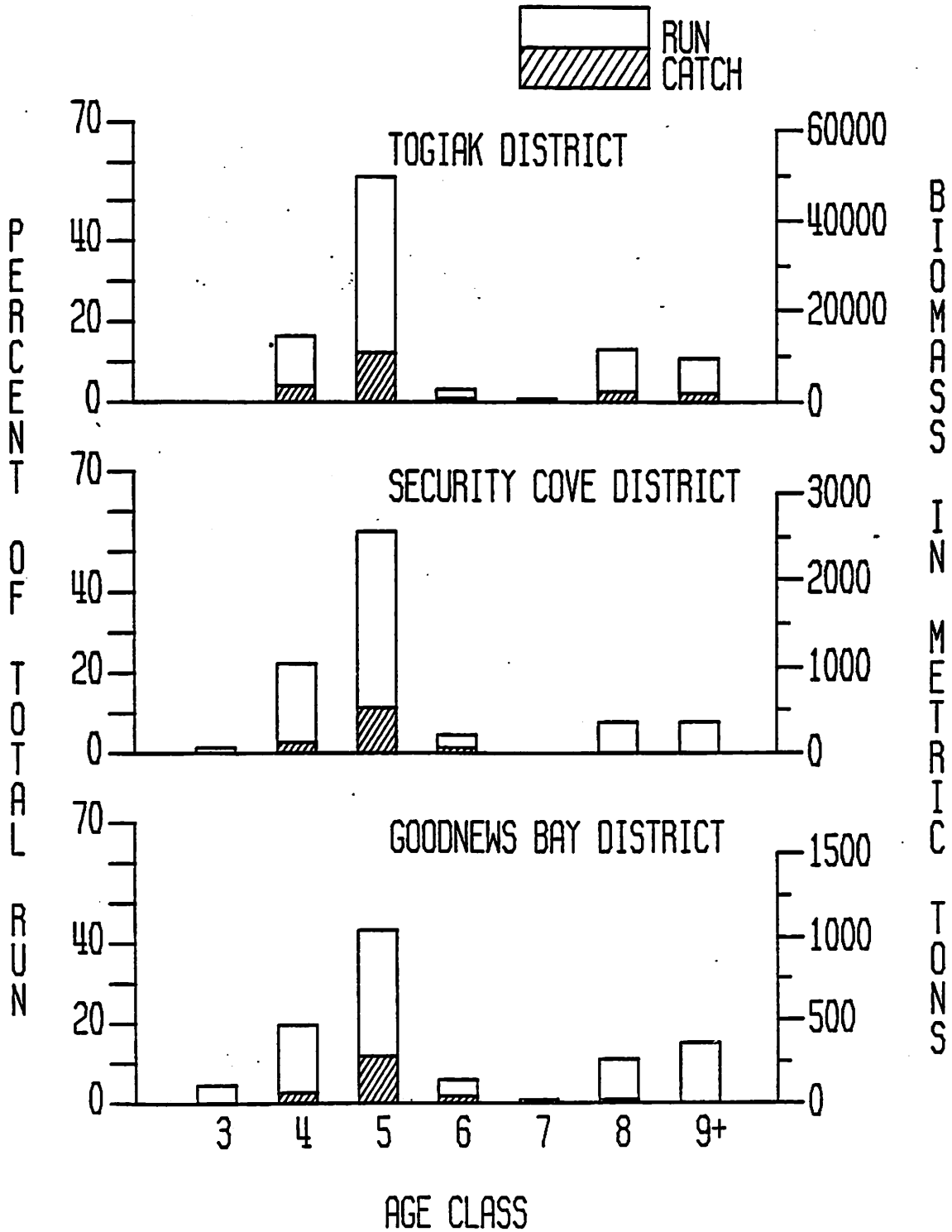

Figure 3. Age composition of Pacific herring in spawning populations and commercial harvests in Togiak, Security Cove and Goodnews Bay Commercial Herring Fishing Districts, Alaska 1982.

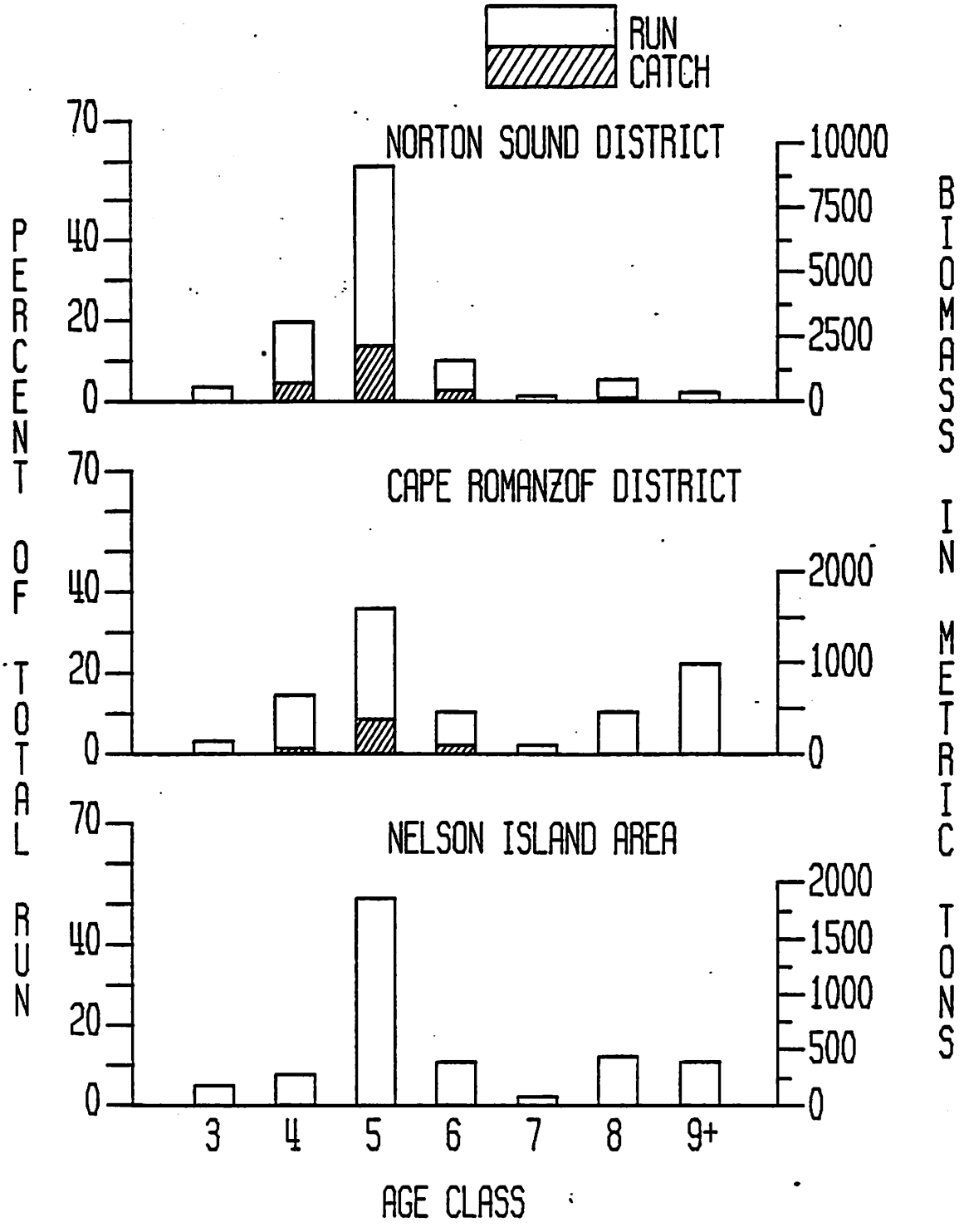

Figure 4. Age composition of Pacific herring in spawning populations and commercial harvests in Cape Romanzof and Norton Sound Commercial Herring Fishing Districts and the Nelson Island area, Alaska, 1982.

AGENDA D-2(b)
DECEMBER 1982

DRAFT

Age, Sex and Size Composition of Pacific Herring, Clupea harengus pallasi, From Eastern Bering Sea Coastal Spawning Sites, Alaska, 1982.

by

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Craig Whitmore and
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Alaska Department of Fish and Game
Division of Commercial Fisheries
Anchorage, Alaska

October, 1982

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ABSTRACT

Pacific herring, Clupea harengus pallasi, were sampled in five eastern Bering Sea Commercial Fishing Districts and Nelson Island, the major subsistence fishing area, during the spring spawning migration of 1982. Samples were taken from commercial gillnet and purse seine harvests, as well as from Alaska Department of Fish and Game variable mesh gillnet and chartered purse seine vessel catches. Samples within each of the six areas were grouped by gear type, sampling week and location.

A total of 10,739 herring were sampled for age, sex, length and weight information. In all areas sampled, the relative proportion of herring age 5 and older decreased as the spawning season progressed. Relative abundance trends for three year classes were similar in all areas: the 1977 and 1978 year classes (ages 5 and 4) were abundant (usually at least 60% of each total area sample), while the 1975 year class (age 7) was poorly represented.

Mean length within each year class progressively decreased in samples taken northward from Togiak to Norton Sound. Mean length at age did not appear to be affected by capture gear type. Generally, males tended to outnumber females in most total season gillnet samples by about 1.2 or 1.5:1. Cape Romanzof gillnet samples and Togiak purse seine samples had 1:1 sex ratios.

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INTRODUCTION

This report is part of a series which has been used to present age, sex and size information for Pacific herring, Clupea harengus pallasi, sampled in eastern Bering Sea coastal waters. Detailed analysis of the 1982 data contained in this report will be included within a forthcoming Alaska Department of Fish and Game (ADF&G) Informational Leaflet.

METHODS

Study Area Description

The study area consisted of the coastal waters between Cape Constantine and Cape Douglas (Figures 1 and 2). Herring samples within this area were collected from Togiak, Security Cove, Goodnews Bay, Cape Romanzof and Norton Sound Commercial Fishing Districts and Nelson Island, the major subsistence fishing area. Total herring spawning biomass in these locations was estimated to be 119,600 m.t. and was distributed as follows: 74% in Togiak, 13% in Norton Sound, 4% each in Security Cove and Cape Romanzof, 3% in Nelson Island and 2% in Goodnews Bay.

Sampling Techniques

Sampling techniques were the same as those described by Fried et al (1982). Herring were sampled from commercial purse seine and gillnet harvests as well as ADF&G chartered purse seine vessel and variable mesh gillnet catches. All herring sampled were identified according to sex, measured (standard length, mm) and aged from scales. Attempts were also made to weigh (g) as many herring as time permitted. Catches within all areas were grouped by sampling week. Catches in all Commercial Districts were also grouped by gear type and, when appropriate, location (Section or Subdistrict).

RESULTS AND DISCUSSION

A total of 10,739 herring were examined during the period 29 April to 30 June 1982 (Tables 1-33). Trends in age and size data generally paralleled those noted in 1981 samples (Fried et al 1982).

No obvious trends or consistant differences in age composition, sex ratio, or mean size at age were noted among Sections in Togiak District or Subdistricts in Norton Sound (Tables 1-18 and 26-33). However, temporal differences in year class abundance were again evident within all areas. Older herring arrived and spawned earlier in the season than younger herring (e.g. Tables 18 and 33).

The 1977 year class (age 5) once again dominated catches in all areas, usually representing 40% or more of the total season sample (Tables 5, 10, 15, 18-25, 29 and 33). The 1978 year class (age 4) was also abundant in all areas, usually representing at least 20% of the total season sample. The 1974 year class (age 8) represented about 20% of Togiak District season samples but was usually less than 10% of the total season samples from the other areas. The 1975 year class (age 7) was poorly represented in all areas. The 1976 year class (age 6) was poorly represented in the more southerly Districts, but represented about 10% or more of the season sample from Nelson Island, Cape Romanzof and Norton Sound.

Mean length within a year class did not appear to differ among samples taken by differnet gear types within the same District (e.g. Tables 5, 10, 15 and 18). However, mean length within all year classes decreased in samples taken progressively northward from Togiak to Norton Sound District. Trends within and between areas for mean weight within each year class were similar, but were not as clearly defined.

Males usually outnumbered females in commercial and variable mesh gillnet catches by ratios of 1.5:1 and 1.2:1, respectively. However, the sex ratio was about 1:1 in Cape Romanzof commercial and variable mesh gillnet catches and in Togiak commercial and chartered purse seine catches.

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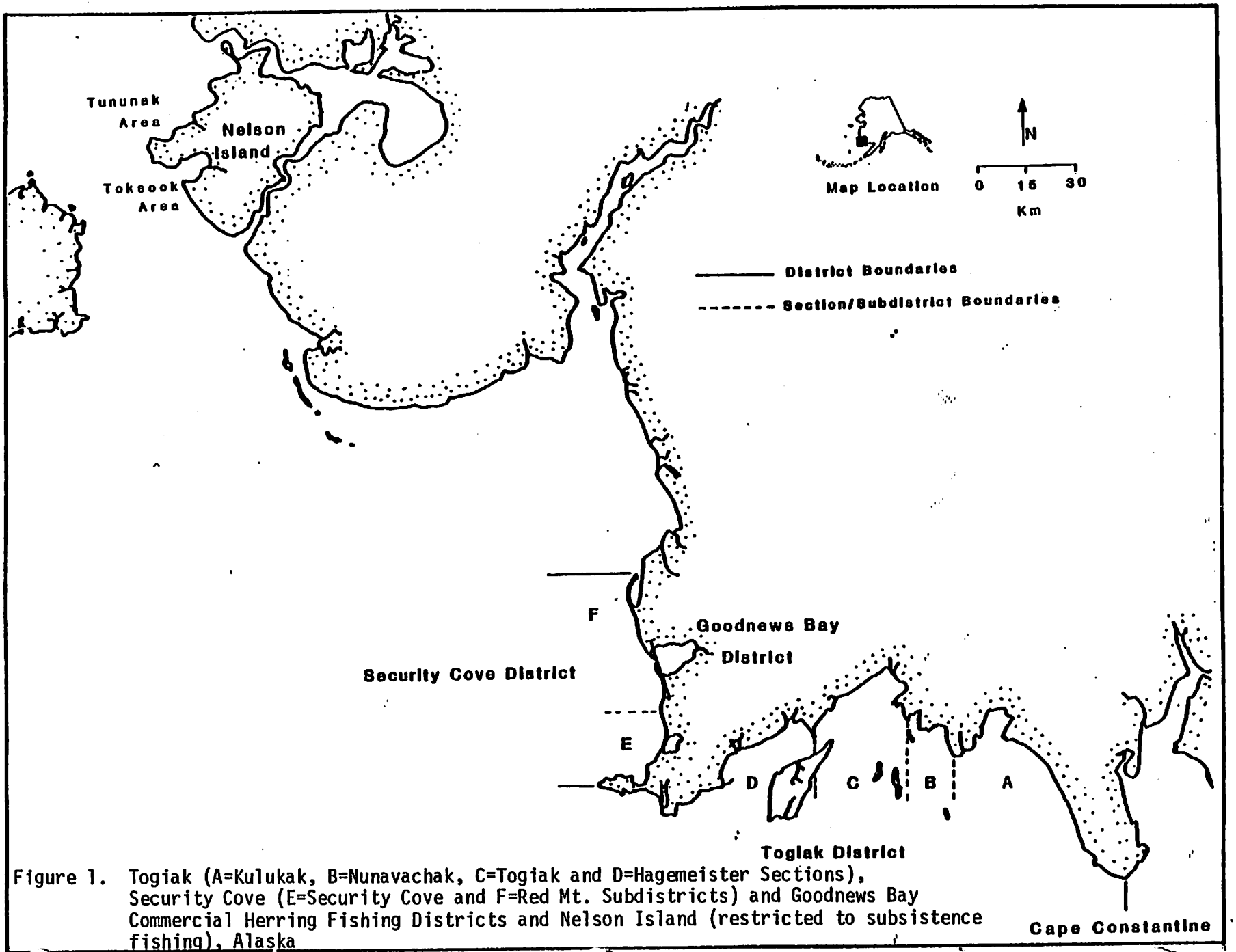

Figure 1. Togiak (A=Kulukak, B=Nunavachak, C=Togiak and D=Hagemeister Sections), Security Cove (E=Security Cove and F=Red Mt. Subdistricts) and Goodnews Bay Commercial Herring Fishing Districts and Nelson Island (restricted to subsistence fishing), Alaska

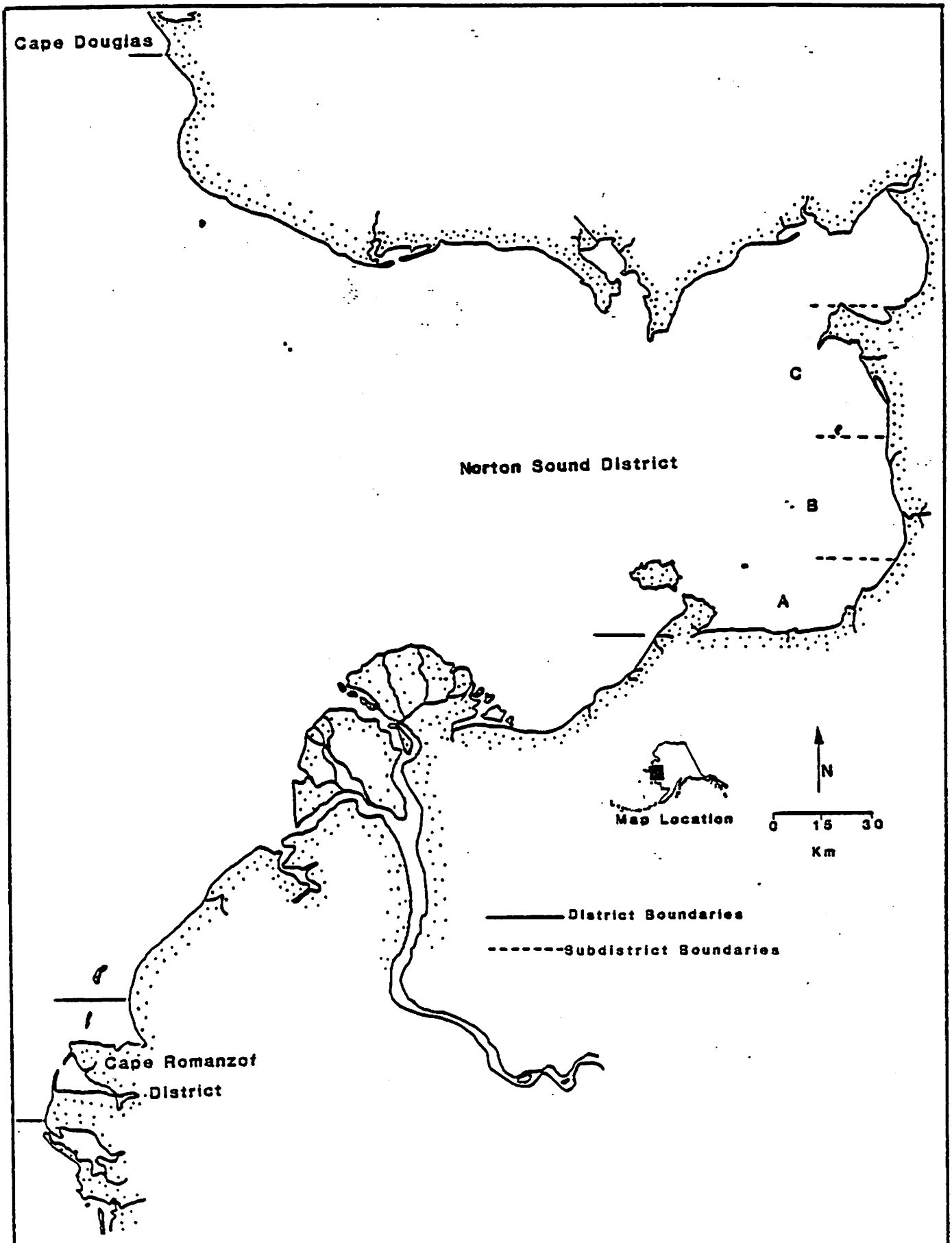

Figure 2. Cape Romanzof and Norton Sound (A=St. Michael, B=Unalakleet and C=Cape Denbigh Subdistricts) Commercial Herring Fishing Districts, Alaska

Table 1 . Age, sex and size data for Pacific herring captured by commercial purse seines in Kulukak Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	26	20	-	46	24.6	184	46	242	46
5/13- 5/19	5	50	56	-	106	56.7	235	106	259	106
	6	3	5	-	8	4.3	269	8	269	8
	7	1	-	-	1	0.5	291	1	286	1
	8	6	10	-	16	8.6	355	16	289	16
	9+	4	6	-	10	5.3	403	10	301	10
Period total		90	97	-	187	100.0	244	187	260	187
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	18	31	-	49	28.7	181	5	239	48
5/20- 5/26	5	34	55	-	89	52.0	236	10	255	87
	6	2	3	-	5	2.9	-	-	267	5
	7	1	2	-	3	1.8	-	-	283	3
	8	8	8	-	16	9.4	348	3	289	16
	9+	3	6	-	9	5.3	-	-	295	9
Period total		66	105	-	171	100.0	239	18	257	168
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	44	51	-	95	26.5	184	51	241	94
All periods	5	84	111	-	195	54.5	235	116	257	193
	6	5	8	-	13	3.6	269	8	268	13
	7	2	2	-	4	1.1	291	1	284	4
	8	14	18	-	32	8.9	354	19	289	32
	9+	7	12	-	19	5.3	403	10	298	19
Total		156	202	-	358	100.0	243	205	258	355

Table 2 . Age, sex and size data for Pacific herring captured by commercial purse seines in Nunavachak Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	35	48	-	83	27.5	179	83	243	83
5/20- 5/26	5	74	86	-	160	53.0	232	160	262	160
	6	2	3	-	5	1.7	250	5	268	5
	7	-	2	-	2	0.7	251	2	269	2
	8	21	19	-	40	13.2	321	40	292	40
	9+	7	5	-	12	4.0	388	12	302	12
Period total		139	163	-	302	100.0	236	302	262	302

Table 3. Age, sex and size data for Pacific herring captured by commercial purse seines in Togiak Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-
5/13- 5/19	5	1	1	-	2	7.1	-	-	262	2
	6	1	-	-	1	3.6	260	1	271	1
	7	-	-	-	-	-	-	-	-	-
	8	2	7	-	9	32.1	369	3	300	9
	9+	4	12	-	16	57.1	418	4	305	16
Period total		8	20	-	28	100.0	380	8	299	28
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	17	8	-	25	19.7	185	19	243	25
5/20- 5/26	5	31	32	-	63	49.6	242	37	257	63
	6	1	4	-	5	3.9	-	-	269	5
	7	-	1	-	1	0.8	-	-	252	1
	8	16	5	-	21	16.5	363	8	289	21
	9+	4	8	-	12	9.4	432	2	295	12
Period total		69	58	-	127	100.0	246	66	263	127
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	17	8	-	25	16.1	185	19	243	25
All periods	5	32	33	-	65	41.9	242	37	257	65
	6	2	4	-	6	3.9	260	1	269	6
	7	-	1	-	1	0.6	-	-	252	1
	8	18	12	-	30	19.4	364	11	292	30
	9+	8	20	-	28	18.1	422	6	301	28
Total		77	78	-	155	100.0	261	74	270	155

Table 4. Age, sex and size data for Pacific herring captured by commercial purse seines in Hagemeister Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	21	18	-	39	13.4	180	9	238	39
5/20- 5/26	5	102	97	-	199	68.4	238	61	254	199
	6	3	9	-	12	4.1	276	4	267	12
	7	2	-	-	2	0.7	255	1	270	2
	8	11	11	-	22	7.6	356	10	286	22
	9+	3	14	-	17	5.8	394	11	294	17
Period total		142	149	-	291	100.0	264	96	257	291

Table 5. Age, sex and size data for Pacific herring captured by commercial purse seines in Kulukak, Nunavachak, Togiak and Hagemeister Sections, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Sex: Female	Sex: Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	26	20	-	46	21.4	184	46	242	46
5/13- 5/19	5	51	57	-	108	50.2	235	106	259	108
	6	4	5	-	9	4.2	268	9	269	9
	7	1	-	-	1	0.5	291	1	286	1
	8	8	17	-	25	11.6	357	19	293	25
	9+	8	18	-	26	12.1	407	14	303	26
Period total		98	117	-	215	100.0	249	195	265	215
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	91	105	-	196	22.0	181	116	241	195
5/20- 5/26	5	241	270	-	511	57.4	235	268	257	509
	6	8	19	-	27	3.0	261	9	267	27
	7	3	5	-	8	0.9	252	3	272	8
	8	56	43	-	99	11.1	333	61	290	99
	9+	17	33	-	50	5.6	394	25	296	50
Period total		416	475	-	891	100.0	243	482	260	888
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	117	125	-	242	21.9	181	162	241	241
All periods	5	292	327	-	619	56.0	235	374	257	617
	6	12	24	-	36	3.3	265	18	268	36
	7	4	5	-	9	0.8	262	4	274	9
	8	64	60	-	124	11.2	339	80	290	124
	9+	25	51	-	76	6.9	399	39	298	76
Total		514	592	-	1106	100.0	245	677	261	1103

Table 6. Age, sex and size data for Pacific herring captured by commercial gillnets in Kulukak Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	21	12	-	33	18.6	190	2	240	33
5/13- 5/19	5	64	39	-	103	58.2	241	11	256	103
	6	5	1	-	6	3.4	-	-	263	6
	7	1	1	-	2	1.1	-	-	280	2
	8	16	5	-	21	11.9	340	1	287	21
	9+	10	2	-	12	6.8	342	2	290	12
Period total		117	60	-	177	100.0	253	16	259	177
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	51	32	-	83	24.0	179	13	243	82
5/20- 5/26	5	132	88	-	220	63.6	213	18	257	209
	6	5	8	-	13	3.8	229	1	271	11
	7	-	-	-	-	-	-	-	-	-
	8	12	8	-	20	5.8	296	3	286	19
	9+	3	7	-	10	2.9	390	1	295	10
Period total		203	143	-	346	100.0	213	36	257	331
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	72	44	-	116	22.2	181	15	242	115
All periods	5	196	127	-	323	61.8	223	29	256	312
	6	10	9	-	19	3.6	229	1	268	17
	7	1	1	-	2	0.4	-	-	280	2
	8	28	13	-	41	7.8	307	4	286	40
	9+	13	9	-	22	4.2	358	3	293	22
Total		320	203	-	523	100.0	225	52	258	508

Table 7. Age, sex and size data for Pacific herring captured by commercial gillnets in Nunavachak Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	20	22	-	42	32.8	185	42	241	42
5/20- 5/26	5	33	38	-	71	55.5	222	71	261	71
	6	4	1	-	5	3.9	242	5	272	5
	7	-	-	-	-	-	-	-	-	-
	8	3	3	-	6	4.7	312	6	294	6
	9+	2	2	-	4	3.1	319	4	295	4
Period total		62	66	-	128	100.0	218	128	258	128

Table 8. Age, sex and size data for Pacific herring captured by commercial gillnets in Togiak Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	1	-	-	1	50.0	205	1	257	1
5/13- 5/19	5	-	1	-	1	50.0	224	1	256	1
	6	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-
	9+	-	-	-	-	-	-	-	-	-
Period total		1	1	-	2	100.0	215	2	257	2
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	16	19	-	35	20.6	183	35	243	35
5/20- 5/26	5	64	30	-	94	55.3	222	94	260	94
	6	4	2	-	6	3.5	243	6	268	6
	7	1	-	-	1	0.6	300	1	275	1
	8	8	8	-	16	9.4	345	16	294	16
	9+	7	11	-	18	10.6	398	18	305	18
Period total		100	70	-	170	100.0	245	170	265	170
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	17	19	-	36	20.9	184	36	244	36
All periods	5	64	31	-	95	55.2	222	95	260	95
	6	4	2	-	6	3.5	243	6	268	6
	7	1	-	-	1	0.6	300	1	275	1
	8	8	8	-	16	9.3	345	16	294	16
	9+	7	11	-	18	10.5	398	18	305	18
Total		101	71	-	172	100.0	245	172	265	172

Table 9. Age, sex and size data for Pacific herring captured by commercial gillnets in Hagemeister Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	5	-	-	5	9.4	225	1	242	5
5/20- 5/26	5	28	15	1	44	83.0	211	14	247	39
	6	2	1	-	3	5.7	204	1	239	2
	7	-	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-
	9+	1	-	-	1	1.9	-	-	292	1
Period total		36	16	1	53	100.0	211	16	247	47

Table 10. Age, sex and size data for Pacific herring captured by commercial gillnets in Kulukak, Nunavachak, Togiak and Hagemeister Sections, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	22	12	-	34	19.0	195	3	241	34
5/13- 5/19	5	64	40	-	104	58.1	239	12	256	104
	6	5	1	-	6	3.4	-	-	263	6
	7	1	1	-	2	1.1	-	-	280	2
	8	16	5	-	21	11.7	340	1	287	21
	9+	10	2	-	12	6.7	342	2	290	12
Period total		118	61	-	179	100.0	249	18	259	179
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	92	73	-	165	23.7	184	91	242	164
5/20- 5/26	5	257	171	1	429	61.5	220	197	257	413
	6	15	12	-	27	3.9	238	13	268	24
	7	1	-	-	1	0.1	300	1	275	1
	8	23	19	-	42	6.0	331	25	290	41
	9+	13	20	-	33	4.7	384	23	300	33
Period total		401	295	1	697	100.0	230	350	258	676
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	114	85	-	199	22.7	184	94	242	198
All periods	5	321	211	1	533	60.8	221	209	257	517
	6	20	13	-	33	3.8	238	13	267	30
	7	2	1	-	3	0.3	300	1	278	3
	8	39	24	-	63	7.2	332	26	289	62
	9+	23	22	-	45	5.1	380	25	298	45
Total		519	356	1	876	100.0	231	368	258	855

Table 11. Age, sex and size data for Pacific herring captured by test purse seines in Kulukak Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	1	-	-	1	0.1	-	-	232	1
	4	102	121	-	223	21.9	195	36	242	223
5/13- 5/19	5	263	275	-	538	52.8	238	135	258	538
	6	12	11	-	23	2.3	271	5	265	23
	7	2	3	-	5	0.5	274	1	278	5
	8	41	38	-	79	7.8	347	24	289	79
	9+	20	30	-	50	4.9	407	14	298	50
Period total		442	478	1	1019	100.0	87	1044	259	919
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	26	27	-	53	34.9	169	7	238	53
5/20- 5/26	5	32	39	-	71	46.7	229	5	255	71
	6	2	2	-	4	2.6	-	-	275	4
	7	1	-	-	1	0.7	-	-	276	1
	8	4	6	-	10	6.6	308	3	288	10
	9+	7	6	-	13	8.6	326	1	295	13
Period total		72	80	-	152	100.0	224	16	255	152
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	1	-	-	1	0.1	-	-	232	1
	4	128	148	-	276	25.8	190	43	241	276
All periods	5	295	314	-	609	56.9	237	140	257	609
	6	14	13	-	27	2.5	271	5	267	27
	7	3	3	-	6	0.6	274	1	278	6
	8	45	44	-	89	8.3	343	27	289	89
	9+	27	36	-	63	5.9	402	15	298	63
Total		513	558	-	1071	100.0	252	231	258	1071

Table 12. Age, sex and size data for Pacific herring captured by test purse seines in Nunavachak Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Sex: Female	Sex: Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	6	8	-	14	6.6	194	14	243	14
5/13- 5/19	5	59	88	-	147	69.7	241	147	257	147
	6	2	4	-	6	2.8	270	6	266	6
	7	1	-	-	1	0.5	304	1	283	1
	8	9	13	-	22	10.4	352	22	287	22
	9+	12	9	-	21	10.0	378	21	296	21
Period total		89	122	-	211	100.0	264	211	264	211
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	2	1	-	3	8.8	183	3	242	3
5/20- 5/26	5	9	11	-	20	58.8	208	20	254	20
	6	-	1	-	1	2.9	265	1	279	1
	7	-	-	-	-	-	-	-	-	-
	8	7	2	-	9	26.5	285	9	286	9
	9+	-	1	-	1	2.9	348	1	300	1
Period total		18	16	-	34	100.0	232	34	264	34
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	8	9	-	17	6.9	192	17	242	17
All periods	5	68	99	-	167	68.2	237	167	257	167
	6	2	5	-	7	2.9	269	7	268	7
	7	1	-	-	1	0.4	304	1	283	1
	8	16	15	-	31	12.7	332	31	287	31
	9+	12	10	-	22	9.0	377	22	296	22
Total		107	138	-	245	100.0	260	245	264	245

Table 13. Age, sex and size data for Pacific herring captured by test purse seines in Togiak Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	14	15	-	29	13.6	201	29	242	29
5/13- 5/19	5	55	71	-	126	59.2	245	126	257	126
	6	4	7	-	11	5.2	278	11	269	11
	7	-	2	-	2	0.9	337	2	280	2
	8	16	8	-	24	11.3	359	24	289	24
	9+	9	12	-	21	9.9	396	21	298	21
Period total		98	115	-	213	100.0	269	213	264	213
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	-	3	-	3	8.8	194	3	238	3
5/20- 5/26	5	11	6	-	17	50.0	226	17	257	17
	6	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-
	8	4	3	-	7	20.6	356	7	285	7
	9+	5	2	-	7	20.6	358	7	291	7
Period total		20	14	-	34	100.0	277	34	268	34
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	14	18	-	32	13.0	200	32	242	32
All periods	5	66	77	-	143	57.9	242	143	257	143
	6	4	7	-	11	4.5	278	11	269	11
	7	-	2	-	2	0.8	337	2	280	2
	8	20	11	-	31	12.6	358	31	288	31
	9+	14	14	-	28	11.3	386	28	296	28
Total		118	129	-	247	100.0	270	247	264	247

Table 14. Age, sex and size data for Pacific herring captured by test purse seines in Hagemeister Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	2	1	-	3	11.5	194	3	246	3
5/20- 5/26	5	7	11	-	18	69.2	235	18	252	18
	6	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-
	8	1	2	-	3	11.5	318	3	282	3
	9+	-	2	-	2	7.7	396	2	283	2
Period total		10	16	-	26	100.0	252	26	257	26

Table 15. Age, sex and size data for Pacific herring captured by test purse seines in Kulukak, Nunavachak, Togiak and Hagemeister Sections, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Sex: Female	Sex: Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	1	-	-	1	0.1	-	-	232	1
	4	122	144	-	266	18.4	197	79	242	266
5/13- 5/19	5	377	434	-	811	56.2	241	408	258	811
	6	18	22	-	40	2.8	274	22	266	40
	7	3	5	-	8	0.6	313	4	279	8
	8	66	59	-	125	8.7	352	70	289	125
	9+	41	51	-	92	6.4	392	56	298	92
Period total		629	715	1	1443	100.0	159	1468	260	1343
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	30	32	-	62	25.2	181	16	238	62
5/20- 5/26	5	59	67	-	126	51.2	223	60	255	126
	6	2	3	-	5	2.0	265	1	276	5
	7	1	-	-	1	0.4	-	-	276	1
	8	16	13	-	29	11.8	316	22	286	29
	9+	12	11	-	23	9.3	361	11	293	23
Period total		120	126	-	246	100.0	250	110	258	246
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	1	-	-	1	0.1	-	-	232	1
	4	152	176	-	328	20.6	194	95	241	328
All periods	5	436	501	-	937	59.0	239	468	257	937
	6	20	25	-	45	2.8	273	23	267	45
	7	4	5	-	9	0.6	313	4	279	9
	8	82	72	-	154	9.7	344	92	288	154
	9+	53	62	-	115	7.2	387	67	297	115
Total		748	841	-	1589	100.0	261	749	260	1589

Table 14. Age, sex and size data for Pacific herring captured by variable mesh gillnets in Kuluhan Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
4/29- 5/ 5	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-
	9+	1	1	-	2	100.0	413	2	385	2
Period total		1	1	-	2	100.0	413	2	385	2
5/ 6- 5/12	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	1	2	-	3	1.9	180	2	242	2
	5	17	9	2	28	17.9	234	23	241	23
	6	3	2	-	5	3.2	288	5	249	4
	7	3	1	-	4	2.6	317	4	282	4
	8	28	33	1	63	40.4	340	58	293	62
	9+	29	24	-	53	34.0	385	50	296	50
Period total		83	70	3	156	100.0	343	142	287	147
5/13- 5/19	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	3	1	-	4	8.7	284	4	244	4
	5	11	16	-	27	58.7	230	27	240	27
	6	1	2	-	3	6.5	257	2	243	2
	7	-	-	-	-	-	-	-	-	-
	8	6	4	-	10	21.7	333	9	287	9
	9+	2	-	-	2	4.3	422	2	311	2
Period total		23	23	-	46	100.0	276	44	266	44
5/20- 5/26	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	1	-	-	1	0.5	-	-	216	1
	4	11	12	-	23	12.2	156	1	235	23
	5	42	39	-	81	43.1	220	6	257	81
	6	1	4	-	5	2.7	-	-	261	5
	7	2	2	-	4	2.1	295	1	293	4
	8	24	23	-	47	25.0	331	5	298	47
	9+	14	13	-	27	14.4	384	5	299	27
Period total		95	93	-	188	100.0	300	18	269	188
5/27- 6/ 2	1	-	-	1	1	0.3	12	1	103	1
	2	-	-	-	-	-	-	-	-	-
	3	-	2	-	2	0.6	-	-	283	2
	4	75	41	-	116	33.7	165	9	235	116
	5	71	59	1	131	38.1	200	12	256	127
	6	6	8	-	14	4.1	241	1	267	14
	7	2	1	-	3	0.9	-	-	275	3
	8	15	21	-	36	10.5	342	6	289	35
	9+	18	23	-	41	11.9	394	5	293	40
Period total		187	155	2	344	100.0	240	34	257	338
6/ 3- 6/ 9	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	3	3	-	6	4.8	-	-	211	6
	4	31	15	-	46	36.5	177	5	231	46
	5	37	21	-	58	46.0	229	5	251	58
	6	4	2	-	6	4.8	262	2	263	6
	7	-	-	-	-	-	-	-	-	-
	8	2	3	-	5	4.0	303	1	280	5
	9+	3	2	-	5	4.0	342	1	294	5
Period total		80	46	-	126	100.0	230	14	245	126
6/10- 6/16	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	1	2	-	3	10.0	98	1	202	3
	4	8	4	-	12	40.0	144	2	228	12
	5	8	3	-	11	36.7	-	-	255	11
	6	-	2	-	2	6.7	-	-	247	2
	7	-	-	-	-	-	-	-	-	-
	8	1	1	-	2	6.7	-	-	270	2
	9+	-	-	-	-	-	-	-	-	-
Period total		18	12	-	30	100.0	129	3	242	30
All periods	1	-	-	1	1	0.1	12	1	103	1
	2	-	-	-	-	-	-	-	-	-
	3	5	7	-	12	1.3	98	1	208	12
	4	129	75	-	204	22.9	173	23	234	203
	5	186	147	3	336	37.7	234	73	254	329
	6	15	20	-	35	3.9	272	10	245	33
	7	7	4	-	11	1.2	312	5	284	11
	8	78	84	1	163	18.3	336	79	290	160
	9+	67	63	-	130	14.6	388	65	297	126
Total		487	400	5	892	100.0	307	257	263	873

Table 17. Age, sex and size data for Pacific herring captured by variable mesh gillnets in Nunavachak Section, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	2	3	-	5	16.1	-	-	242	5
5/13- 5/19	5	9	5	-	14	45.2	-	-	259	13
	6	-	1	-	1	3.2	-	-	270	1
	7	1	-	-	1	3.2	-	-	266	1
	8	3	5	-	8	25.8	-	-	292	8
	9+	1	1	-	2	6.5	-	-	293	2
Period total		16	15	-	31	100.0	-	-	268	30
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	7	2	-	9	13.4	174	9	236	9
5/20- 5/26	5	20	22	-	42	62.7	235	42	254	42
	6	1	3	-	4	6.0	275	4	267	4
	7	-	-	-	-	-	-	-	-	-
	8	4	3	-	7	10.4	349	7	283	7
	9+	5	-	-	5	7.5	403	5	297	5
Period total		37	30	-	67	100.0	253	67	259	67
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	9	5	-	14	14.3	174	9	238	14
All periods	5	29	27	-	56	57.1	235	42	255	55
	6	1	4	-	5	5.1	275	4	267	5
	7	1	-	-	1	1.0	-	-	266	1
	8	7	8	-	15	15.3	349	7	288	15
	9+	6	1	-	7	7.1	403	5	296	7
Total		53	45	-	98	100.0	253	67	262	97

Table 18. Age, sex and size data for Pacific herring captured by variable mesh gillnets in Kuluhak and Nunavachak Sections, Togiak District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
4/29- 5/ 5	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-
	9+	1	1	-	2	100.0	413	2	305	2
Period total		1	1	-	2	100.0	413	2	305	2
5/ 6- 5/12	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	1	2	-	3	1.9	188	2	242	2
	5	17	9	2	28	17.9	234	23	261	25
	6	3	2	-	5	3.2	288	5	269	4
	7	3	1	-	4	2.6	317	4	282	4
	8	28	32	1	61	40.4	340	58	293	62
	9+	29	24	-	53	34.0	385	50	296	50
Period total		83	70	3	156	100.0	343	142	287	147
5/13- 5/19	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	5	4	-	9	11.7	284	4	243	9
	5	20	21	-	41	53.2	258	27	260	40
	6	1	3	-	4	5.2	257	2	265	3
	7	1	-	-	1	1.3	-	-	266	1
	8	9	9	-	18	23.4	335	9	289	17
	9+	3	1	-	4	5.2	432	2	282	4
Period total		39	38	-	77	100.0	276	44	267	74
5/20- 5/26	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	1	-	-	1	0.4	-	-	216	1
	4	18	14	-	32	12.5	172	18	236	32
	5	62	61	-	123	48.2	224	48	256	123
	6	2	7	-	9	3.5	275	4	264	9
	7	2	2	-	4	1.6	293	1	293	4
	8	28	26	-	54	21.2	341	12	289	54
	9+	19	13	-	32	12.5	394	10	298	32
Period total		132	123	-	255	100.0	263	85	266	255
5/27- 6/ 2	1	-	-	1	1	0.3	12	1	103	1
	2	-	-	-	-	-	-	-	-	-
	3	-	2	-	2	0.6	-	-	293	2
	4	75	41	-	116	33.7	165	9	235	116
	5	71	59	1	131	38.1	209	12	256	127
	6	6	8	-	14	4.1	241	1	267	14
	7	2	1	-	3	0.9	-	-	275	3
	8	15	21	-	36	10.5	342	6	289	35
	9+	18	23	-	41	11.9	394	5	295	40
Period total		187	155	2	344	100.0	240	34	257	338
6/ 3- 6/ 9	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	3	3	-	6	4.8	-	-	211	6
	4	31	15	-	46	34.3	177	5	231	46
	5	37	21	-	58	46.0	229	5	251	58
	6	4	2	-	6	4.8	262	2	263	6
	7	-	-	-	-	-	-	-	-	-
	8	2	3	-	5	4.0	283	1	280	5
	9+	3	2	-	5	4.0	342	1	294	5
Period total		80	46	-	126	100.0	230	14	245	126
6/10- 6/16	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	1	2	-	3	10.0	98	1	202	3
	4	8	4	-	12	40.0	144	2	228	12
	5	8	3	-	11	36.7	-	-	255	11
	6	-	2	-	2	6.7	-	-	267	2
	7	-	-	-	-	-	-	-	-	-
	8	1	1	-	2	6.7	-	-	290	2
	9+	-	-	-	-	-	-	-	-	-
Period total		18	12	-	30	100.0	129	3	242	30
All periods	1	-	-	1	1	0.1	12	1	103	1
	2	-	-	-	-	-	-	-	-	-
	3	5	7	-	12	1.2	98	1	208	12
	4	138	89	-	218	22.0	173	32	234	217
	5	215	174	3	392	39.4	234	115	256	384
	6	14	24	-	40	4.0	273	14	266	38
	7	8	4	-	12	1.2	312	5	282	12
	8	85	92	1	178	18.0	335	86	290	175
	9+	73	64	-	137	13.8	389	70	297	133
Total		540	445	5	990	100.0	296	324	263	972

Table 19. Age, sex and size data for Pacific herring captured by commercial gillnets in Security Cove District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	15	6	-	21	12.2	183	21	240	21
5/20- 5/26	5	99	30	-	129	75.0	221	129	252	129
	6	15	5	-	20	11.6	240	20	259	20
	7	-	-	-	-	-	-	-	-	-
	8	2	-	-	2	1.2	331	2	291	2
	9+	-	-	-	-	-	-	-	-	-
Period total		131	41	-	172	100.0	220	172	252	172
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	26	28	-	54	20.1	175	54	232	54
5/27- 6/ 2	5	114	76	-	190	70.6	224	190	251	189
	6	8	9	-	17	6.3	248	17	262	17
	7	-	-	-	-	-	-	-	-	-
	8	4	2	-	6	2.2	321	6	284	6
	9+	2	-	-	2	0.7	384	2	295	2
Period total		154	115	-	269	100.0	219	269	249	268
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	30	46	-	76	28.9	167	76	232	76
6/ 3- 6/ 9	5	101	73	-	174	66.2	210	174	249	174
	6	7	1	-	8	3.0	232	8	257	8
	7	-	-	-	-	-	-	-	-	-
	8	1	2	-	3	1.1	260	3	277	3
	9+	2	-	-	2	0.8	270	2	284	2
Period total		141	122	-	263	100.0	199	263	245	263
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	71	80	-	151	21.4	172	151	233	151
All periods	5	314	179	-	493	70.0	218	493	250	492
	6	30	15	-	45	6.4	241	45	260	45
	7	-	-	-	-	-	-	-	-	-
	8	7	4	-	11	1.6	306	11	283	11
	9+	4	-	-	4	0.6	327	4	289	4
Total		426	278	-	704	100.0	212	704	248	703

Table 20. Age, sex and size data for Pacific herring captured by variable mesh gillnets in Security Cove District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	1	1	-	2	15.4	200	2	247	2
5/13- 5/19	5	6	2	-	8	61.5	216	8	254	8
	6	1	-	-	1	7.7	255	1	265	1
	7	-	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-
	9+	1	1	-	2	15.4	336	2	285	2
Period total		9	4	-	13	100.0	235	13	258	13
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	1	-	1	0.5	134	1	210	1
	4	29	23	-	52	23.5	168	52	233	52
5/20- 5/26	5	64	62	-	126	57.0	226	126	254	126
	6	7	5	-	12	5.4	237	12	258	12
	7	-	-	-	-	-	-	-	-	-
	8	6	10	-	16	7.2	327	16	284	16
	9+	8	6	-	14	6.3	375	14	294	14
Period total		114	107	-	221	100.0	229	221	254	221
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	1	-	-	1	0.5	188	1	208	1
	4	43	22	-	65	31.4	177	64	233	65
5/27- 6/ 2	5	70	50	-	120	58.0	218	120	248	120
	6	6	3	-	9	4.3	243	9	258	9
	7	-	2	-	2	1.0	277	2	270	2
	8	2	3	-	5	2.4	333	5	281	5
	9+	2	3	-	5	2.4	369	5	295	5
Period total		124	83	-	207	100.0	213	206	246	207
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	6	9	-	15	7.4	110	15	202	15
	4	41	27	-	68	33.7	156	68	226	68
6/ 3- 6/ 9	5	44	49	-	93	46.0	221	93	248	93
	6	3	3	-	6	3.0	245	6	254	6
	7	-	-	-	-	-	-	-	-	-
	8	5	6	-	11	5.4	331	11	284	11
	9+	6	2	1	9	4.5	366	9	291	9
Period total		105	96	1	202	100.0	204	202	241	202
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	7	10	-	17	2.6	116	17	202	17
	4	114	73	-	187	29.1	167	186	231	187
All periods	5	184	163	-	347	54.0	222	347	250	347
	6	17	11	-	28	4.4	241	28	258	28
	7	-	2	-	2	0.3	277	2	270	2
	8	13	19	-	32	5.0	329	32	283	32
	9+	17	12	1	30	4.7	369	30	293	30
Total		352	290	1	643	100.0	216	642	247	643

Table 21. Age, sex and size data for Pacific herring captured by commercial gillnets in Goodnews Bay District, 1982.

Sample Period	Age (years)	Sex: Male	Sex: Female	Sex: Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	5	7	-	12	7.4	176	12	238	12
5/20- 5/26	5	74	49	-	123	75.5	214	123	252	122
	6	10	3	-	13	8.0	239	13	257	13
	7	-	-	-	-	-	-	-	-	-
	8	6	4	-	10	6.1	305	10	278	10
	9+	5	-	-	5	3.1	362	5	291	5
Period total		100	63	-	163	100.0	223	163	254	162
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	21	17	-	38	20.2	175	38	234	38
5/27- 6/ 2	5	77	40	1	118	62.8	212	118	249	118
	6	15	9	-	24	12.8	242	24	261	24
	7	1	1	-	2	1.1	244	2	265	2
	8	1	2	-	3	1.6	323	3	288	3
	9+	1	2	-	3	1.6	342	3	285	3
Period total		116	71	1	188	100.0	213	188	249	188
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	28	21	-	49	28.7	168	49	232	49
6/ 3- 6/ 9	5	57	44	-	101	59.1	214	101	248	101
	6	7	2	-	9	5.3	219	9	260	9
	7	1	-	-	1	0.6	247	1	262	1
	8	4	3	-	7	4.1	324	7	281	7
	9+	2	2	-	4	2.3	339	4	283	4
Period total		99	72	-	171	100.0	208	171	246	171
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	54	45	-	99	19.0	172	99	233	99
All periods	5	208	133	1	342	65.5	213	342	250	341
	6	32	14	-	46	8.8	237	46	260	46
	7	2	1	-	3	0.6	245	3	264	3
	8	11	9	-	20	3.8	314	20	281	20
	9+	8	4	-	12	2.3	349	12	287	12
Total		315	206	1	522	100.0	215	522	250	521

Age, sex and size data for Pacific herring captured by variable mesh gillnets in Goodnews Bay District, 1982.

Sample Period	Age (years)	Sex: Male	Sex: Female	Sex: Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
5/20- 5/26	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	4	-	-	4	2.7	118	4	209	3
	4	5	4	-	9	6.0	176	9	232	9
	5	39	19	-	58	38.9	228	58	252	58
	6	11	4	-	15	10.1	234	15	255	15
	7	1	-	-	1	0.7	342	1	285	1
	8	15	16	-	31	20.8	342	31	284	31
	9+	19	12	-	31	20.8	387	31	295	31
Period total		94	55	-	149	100.0	280	149	266	148
5/27- 6/ 2	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	6	6	-	12	6.5	120	12	201	12
	4	25	35	-	60	32.3	161	60	224	60
	5	41	48	-	89	47.8	219	89	248	89
	6	4	3	-	7	3.8	238	7	252	7
	7	2	-	-	2	1.1	269	2	274	2
	8	3	2	-	5	2.7	306	5	282	5
	9+	7	4	-	11	5.9	318	11	292	11
Period total		88	98	-	186	100.0	203	186	241	186
6/ 3- 6/ 9	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	17	14	-	31	15.4	110	31	203	31
	4	41	34	-	75	37.3	148	75	224	75
	5	41	41	-	82	40.8	208	82	246	82
	6	4	3	-	7	3.5	266	7	263	7
	7	-	-	-	-	-	-	-	-	-
	8	-	1	-	1	0.5	306	1	278	1
	9+	2	3	-	5	2.5	344	5	290	5
Period total		105	96	-	201	100.0	176	201	233	201
periods	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	27	20	-	47	8.8	113	47	203	46
	4	71	73	-	144	26.9	155	144	224	144
	5	121	108	-	229	42.7	217	229	248	229
	6	19	10	-	29	5.4	243	29	256	29
	7	3	-	-	3	0.6	293	3	278	3
	8	18	19	-	37	6.7	336	37	284	37
	9+	28	19	-	47	8.8	366	47	294	47
Total		287	249	-	536	100.0	214	536	245	535

Table 23. Age, sex and size data for Pacific herrring captured by variable mesh gillnets in Tununak area, Nelson Island, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	4	1	-	5	4.7	172	5	231	5
5/27- 6/ 2	5	40	32	-	72	67.3	214	72	246	72
	6	4	11	-	15	14.0	239	15	254	15
	7	2	-	-	2	1.9	287	2	269	2
	8	2	6	-	8	7.5	326	8	279	8
	9+	2	3	-	5	4.7	368	5	285	5
Period total		54	53	-	107	100.0	232	107	251	107
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	3	-	-	3	1.5	89	3	191	3
	4	9	10	-	19	9.5	164	19	230	19
6/ 3- 6/ 9	5	58	56	-	114	56.7	210	114	246	114
	6	12	8	-	20	10.0	243	20	255	20
	7	4	-	-	4	2.0	304	4	278	4
	8	15	7	-	22	10.9	301	22	276	22
	9+	9	10	-	19	9.5	359	19	287	19
Period total		110	91	-	201	100.0	233	201	252	201
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	22	12	-	34	44.2	108	34	206	34
	4	8	9	-	17	22.1	139	17	224	17
6/10- 6/16	5	10	8	-	18	23.4	177	18	237	18
	6	1	2	-	3	3.9	191	3	252	3
	7	-	-	-	-	-	-	-	-	-
	8	3	1	-	4	5.2	245	4	272	4
	9+	-	1	-	1	1.3	308	1	296	1
Period total		44	33	-	77	100.0	144	77	224	77
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	25	12	-	37	9.6	107	37	205	37
	4	21	20	-	41	10.6	154	41	228	41
All periods	5	108	96	-	204	53.0	209	204	245	204
	6	17	21	-	38	9.9	238	38	255	38
	7	6	-	-	6	1.6	298	6	275	6
	8	20	14	-	34	8.8	300	34	276	34
	9+	11	14	-	25	6.5	359	25	287	25
Total		208	177	-	385	100.0	215	385	246	385

Table 24. Age, sex and size data for Pacific herring captured by commercial gillnets in Cape Romanzof District, 1982.

Sample Period	Age (years)	Sex: Male	Sex: Female	Sex: Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	1	-	-	1	1.1	-	-	245	1
5/27- 6/ 2	5	22	21	14	57	65.5	-	-	244	57
	6	10	3	9	22	25.3	-	-	248	22
	7	2	-	1	3	3.4	-	-	267	3
	8	2	-	1	3	3.4	-	-	273	3
	9+	-	-	1	1	1.1	-	-	300	1
Period total		37	24	26	87	100.0	-	-	248	87
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	19	21	-	40	15.3	-	-	227	40
6/ 3- 6/ 9	5	66	106	-	172	65.9	-	-	240	172
	6	17	13	-	30	11.5	-	-	247	30
	7	1	2	-	3	1.1	-	-	259	3
	8	6	5	-	11	4.2	-	-	276	11
	9+	1	4	-	5	1.9	-	-	293	5
Period total		110	151	-	261	100.0	-	-	241	261
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	1	-	1	0.4	-	-	199	1
	4	20	22	-	42	16.4	167	1	229	42
6/10- 6/16	5	82	90	-	172	67.2	200	15	239	172
	6	20	8	-	28	10.9	223	1	251	28
	7	-	1	-	1	0.4	-	-	272	1
	8	2	4	-	6	2.3	302	1	269	6
	9+	4	2	-	6	2.3	280	1	280	6
Period total		128	128	-	256	100.0	209	19	240	256
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	1	-	1	0.2	-	-	199	1
	4	40	43	-	83	13.7	167	1	228	83
All periods	5	170	217	14	401	66.4	200	15	240	401
	6	47	24	9	80	13.2	223	1	249	80
	7	3	3	1	7	1.2	-	-	265	7
	8	10	9	1	20	3.3	302	1	274	20
	9+	5	6	1	12	2.0	280	1	287	12
Total		275	303	26	604	100.0	209	19	242	604

Table 25. Age, sex and size data for Pacific herring captured by variable mesh gillnets in Cape Romanzof District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	1	-	1	0.4	85	1	189	1
	4	27	17	-	44	17.9	151	44	224	44
5/27- 6/ 2	5	53	51	-	104	42.3	197	104	239	104
	6	10	18	-	28	11.4	247	28	255	28
	7	4	4	-	8	3.3	265	8	265	8
	8	9	11	-	20	8.1	283	20	270	20
	9+	23	17	1	41	16.7	340	41	284	39
Period total		126	119	1	246	100.0	227	246	248	244
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	14	7	-	21	9.1	99	21	192	21
	4	25	29	-	54	23.3	161	54	224	54
6/ 3- 6/ 9	5	40	47	-	87	37.5	198	87	239	87
	6	11	7	-	18	7.8	232	18	251	18
	7	1	1	-	2	0.9	316	2	265	2
	8	6	12	-	18	7.8	311	18	272	17
	9+	11	21	-	32	13.8	357	32	286	32
Period total		108	124	-	232	100.0	215	232	241	231
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	8	9	-	17	14.3	99	17	198	17
	4	19	7	-	26	21.8	147	26	223	26
6/10- 6/16	5	25	22	-	47	39.5	192	46	239	47
	6	6	5	-	11	9.2	215	11	247	11
	7	-	1	-	1	0.8	287	1	276	1
	8	1	6	-	7	5.9	325	7	274	7
	9+	2	8	-	10	8.4	355	10	285	10
Period total		61	58	-	119	100.0	193	118	237	119
	1	-	-	-	-	-	-	-	-	-
	2	2	2	-	4	28.6	46	4	160	4
	3	1	6	-	7	50.0	87	7	196	7
	4	-	-	-	-	-	-	-	-	-
6/17- 6/23	5	-	2	-	2	14.3	136	2	228	2
	6	1	-	-	1	7.1	185	1	255	1
	7	-	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-
	9+	-	-	-	-	-	-	-	-	-
Period total		4	10	-	14	100.0	89	14	195	14
	1	-	-	-	-	-	-	-	-	-
	2	2	2	-	4	0.7	46	4	160	4
	3	23	23	-	46	7.5	97	46	195	46
	4	71	53	-	124	20.3	154	124	224	124
All periods	5	118	122	-	240	39.3	196	239	239	240
	6	28	30	-	58	9.5	235	58	252	58
	7	5	6	-	11	1.8	276	11	266	11
	8	16	29	-	45	7.4	301	45	272	44
	9+	36	46	1	83	13.6	348	83	285	81
Total		299	311	1	611	100.0	213	610	242	608

Table 26 . Age, sex and size data for Pacific herring captured by commercial gillnets in St. Michael Subdistrict, Norton Sound District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	52	25	-	77	27.1	167	75	229	75
6/ 3- 6/ 9	5	86	75	-	161	56.7	199	155	244	157
	6	17	15	-	32	11.3	235	31	256	31
	7	3	-	-	3	1.1	253	3	264	3
	8	6	1	-	7	2.5	265	6	266	6
	9+	4	-	-	4	1.4	298	4	274	4
Period total		168	116	-	284	100.0	197	274	242	276

Table 27 . Age, sex and size data for Pacific herring captured by commercial gillnets in Unalakleet Subdistrict, Norton Sound District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	6	8	-	14	43.8	143	14	222	14
5/27- 6/ 2	5	7	11	-	18	56.3	145	18	222	17
	6	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-
	9+	-	-	-	-	-	-	-	-	-
Period total		13	19	-	32	100.0	144	32	222	31
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	16	6	-	22	21.8	184	10	233	22
6/ 3- 6/ 9	5	39	22	-	61	60.4	201	39	240	61
	6	11	2	-	13	12.9	230	9	251	13
	7	2	-	-	2	2.0	273	2	263	2
	8	2	-	-	2	2.0	273	2	266	2
	9+	-	1	-	1	1.0	286	1	275	1
Period total		70	31	-	101	100.0	208	63	241	101
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	22	14	-	36	27.1	160	24	229	36
All periods	5	46	33	-	79	59.4	183	57	236	78
	6	11	2	-	13	9.8	230	9	251	13
	7	2	-	-	2	1.5	273	2	263	2
	8	2	-	-	2	1.5	273	2	266	2
	9+	-	1	-	1	0.8	286	1	275	1
Total		83	50	-	133	100.0	187	95	237	132

Table 28. Age, sex and size data for Pacific herring captured by commercial gillnets in Cape Denbigh Subdistrict, Norton Sound District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	17	17	-	34	15.5	165	28	229	34
6/10- 6/16	5	99	63	1	163	74.1	183	124	238	163
	6	9	6	-	15	6.8	210	15	250	15
	7	1	1	-	2	0.9	275	1	264	2
	8	1	5	-	6	2.7	270	4	268	6
	9+	-	-	-	-	-	-	-	-	-
Period total		127	92	1	220	100.0	185	172	238	220

Table 29. Age, sex and size data for Pacific herring captured by commercial gillnets in St. Michael, Unalakleet and Cape Denbigh Subdistricts, Norton Sound District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	6	8	-	14	43.8	143	14	222	14
5/27- 6/ 2	5	7	11	-	18	56.3	145	18	222	17
	6	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-
	9+	-	-	-	-	-	-	-	-	-
Period total		13	19	-	32	100.0	144	32	222	31
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	68	31	-	99	25.7	169	85	230	97
6/ 3- 6/ 9	5	125	97	-	222	57.7	199	194	243	218
	6	28	17	-	45	11.7	234	40	255	44
	7	5	-	-	5	1.3	261	5	263	5
	8	8	1	-	9	2.3	267	8	266	8
	9+	4	1	-	5	1.3	296	5	274	5
Period total		238	147	-	385	100.0	199	337	242	377
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	17	17	-	34	15.5	165	28	229	34
6/10- 6/16	5	99	63	1	163	74.1	183	124	238	163
	6	9	6	-	15	6.8	210	15	250	15
	7	1	1	-	2	0.9	275	1	264	2
	8	1	5	-	6	2.7	270	4	268	6
	9+	-	-	-	-	-	-	-	-	-
Period total		127	92	1	220	100.0	185	172	238	220
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	91	56	-	147	23.1	165	127	229	145
All periods	5	231	171	1	403	63.3	190	336	240	398
	6	37	23	-	60	9.4	227	55	253	59
	7	6	1	-	7	1.1	264	6	263	7
	8	9	6	-	15	2.4	268	12	267	14
	9+	4	1	-	5	0.8	296	5	274	5
Total		378	258	1	637	100.0	192	541	240	628

Table 30. Age, sex and size data for Pacific herring captured by variable mesh gillnets in St. Michael Subdistrict, Norton Sound District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-
5/27- 6/ 2	5	4	4	-	8	100.0	130	8	215	8
	6	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-	-
	9+	-	-	-	-	-	-	-	-	-
Period total		4	4	-	8	100.0	130	8	215	8
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	1	-	1	0.4	115	1	207	1
	4	11	15	-	26	10.8	167	26	229	26
6/ 3- 6/ 9	5	74	49	-	123	51.3	198	122	239	122
	6	29	27	-	56	23.3	235	56	252	56
	7	2	1	-	3	1.3	269	3	260	3
	8	8	13	-	21	8.8	308	21	274	21
	9+	6	4	-	10	4.2	318	10	277	10
Period total		130	110	-	240	100.0	218	239	246	239
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	2	2	-	4	2.2	98	4	200	4
	4	27	25	-	52	28.1	148	52	224	52
6/10- 6/16	5	53	46	1	100	54.1	169	100	237	100
	6	11	10	-	21	11.4	201	21	252	21
	7	-	2	-	2	1.1	275	2	266	2
	8	2	2	-	4	2.2	252	4	266	4
	9+	2	-	-	2	1.1	295	2	278	2
Period total		97	87	1	185	100.0	170	185	236	185
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	6	9	-	15	6.6	82	15	189	15
	4	32	19	-	51	22.3	134	51	224	51
6/17- 6/23	5	80	63	-	143	62.4	155	143	234	143
	6	5	6	-	11	4.8	199	11	255	11
	7	1	-	-	1	0.4	233	1	-	-
	8	1	3	-	4	1.7	241	4	263	4
	9+	3	1	-	4	1.7	295	4	285	4
Period total		128	101	-	229	100.0	152	229	231	228
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	7	3	-	10	5.4	83	10	191	10
	4	21	18	1	40	21.5	132	40	224	40
6/24- 6/30	5	50	61	-	111	59.7	160	111	238	111
	6	4	7	-	11	5.9	193	11	252	11
	7	-	1	-	1	0.5	190	1	254	1
	8	4	6	-	10	5.4	233	10	267	10
	9+	-	3	-	3	1.6	259	3	278	3
Period total		86	99	1	186	100.0	157	186	235	186
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	15	15	-	30	3.5	85	30	192	30
	4	91	77	1	169	19.9	143	169	225	169
All periods	5	261	223	1	485	57.2	170	484	236	484
	6	49	50	-	99	11.7	219	99	252	99
	7	3	4	-	7	0.8	254	7	261	6
	8	15	24	-	39	4.6	276	39	270	39
	9+	11	8	-	19	2.2	301	19	278	19
Total		445	401	2	848	100.0	176	847	237	846

Table 31. Age, sex and size data for Pacific herring captured by variable mesh gillnets in Unalakleet Subdistrict, Norton Sound District, 1982.

Sample Period	Age (years)	Sex: Male	Sex: Female	Sex: Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-
5/27- 6/ 2	5	-	1	-	1	33.3	-	-	217	1
	6	-	1	-	1	33.3	240	1	265	1
	7	-	-	-	-	-	-	-	-	-
	8	-	1	-	1	33.3	327	1	294	1
	9+	-	-	-	-	-	-	-	-	-
Period total		-	3	-	3	100.0	284	2	259	3
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	51	25	-	76	36.4	164	74	230	76
6/ 3- 6/ 9	5	60	51	-	111	53.1	200	110	241	111
	6	7	5	-	12	5.7	250	12	259	12
	7	-	2	-	2	1.0	321	2	275	2
	8	3	5	-	8	3.8	303	8	277	8
	9+	-	-	-	-	-	-	-	-	-
Period total		121	88	-	209	100.0	196	206	240	209
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	51	25	-	76	35.8	164	74	230	76
All periods	5	60	52	-	112	52.8	200	110	241	112
	6	7	6	-	13	6.1	249	13	260	13
	7	-	2	-	2	0.9	321	2	275	2
	8	3	6	-	9	4.2	305	9	278	9
	9+	-	-	-	-	-	-	-	-	-
Total		121	91	-	212	100.0	196	208	240	212

Table 32. Age, sex and size data for Pacific herring captured by variable mesh gillnets in Cape Denbigh Subdistrict, Norton Sound District, 1982.

Sample Period	Age (years)	Sex: Male	Sex: Female	Sex: Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	7	4	-	11	6.9	89	11	192	11
	4	24	19	-	43	26.9	145	43	221	43
6/10- 6/16	5	50	48	-	98	61.3	161	98	233	98
	6	-	3	-	3	1.9	227	3	253	3
	7	1	-	-	1	0.6	272	1	267	1
	8	-	2	-	2	1.3	299	2	266	2
	9+	-	2	-	2	1.3	295	2	295	2
Period total		82	78	-	160	100.0	157	160	229	160
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	3	1	-	4	2.6	81	4	189	4
	4	25	11	-	36	23.4	134	36	223	36
6/17- 6/23	5	54	50	-	104	67.5	157	104	234	104
	6	2	2	-	4	2.6	196	4	249	4
	7	-	2	-	2	1.3	220	2	260	2
	8	2	2	-	4	2.6	239	4	275	4
	9+	-	-	-	-	-	-	-	-	-
Period total		86	68	-	154	100.0	154	154	232	154
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	39	24	-	63	38.9	77	63	186	63
	4	20	17	-	37	22.8	130	37	220	37
6/24- 6/30	5	33	24	1	58	35.8	159	58	234	58
	6	1	1	-	2	1.2	217	2	259	2
	7	-	-	-	-	-	-	-	-	-
	8	1	1	-	2	1.2	262	2	269	2
	9+	-	-	-	-	-	-	-	-	-
Period total		94	67	1	162	100.0	122	162	213	162
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	49	29	-	78	16.4	79	78	187	78
	4	69	47	-	116	24.4	137	116	221	116
All periods	5	137	122	1	260	54.6	159	260	234	260
	6	3	6	-	9	1.9	211	9	252	9
	7	1	2	-	3	0.6	237	3	262	3
	8	3	5	-	8	1.7	260	8	271	8
	9+	-	2	-	2	0.4	295	2	295	2
Total		262	213	1	476	100.0	144	476	225	476

Table 33. Age, sex and size data for Pacific herring captured by variable mesh gillnets in St. Michael, Unalakleet and Cape Denbigh Subdistricts, Norton Sound District, 1982.

Sample Period	Age (years)	Sex: Male	Female	Unknown	Total	Percent of Total	Mean Weight (gm)	Number Weighed	Mean Standard Length (mm)	Number Measured
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-
5/27- 6/ 2	5	4	5	-	9	81.8	130	8	215	9
	6	-	1	-	1	9.1	240	1	265	1
	7	-	-	-	-	-	-	-	-	-
	8	-	1	-	1	9.1	327	1	294	1
	9+	-	-	-	-	-	-	-	-	-
Period total		4	7	-	11	100.0	160	10	227	11
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	-	1	-	1	0.2	115	1	207	1
	4	62	40	-	102	22.7	165	100	229	102
6/ 3- 6/ 9	5	134	100	-	234	52.1	199	232	240	233
	6	36	32	-	68	15.1	238	68	253	68
	7	2	3	-	5	1.1	290	5	266	5
	8	11	18	-	29	6.5	307	29	275	29
	9+	6	4	-	10	2.2	318	10	277	10
Period total		251	198	-	449	100.0	208	445	243	448
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	9	6	-	15	4.3	92	15	194	15
	4	51	44	-	95	27.5	147	95	223	95
6/10- 6/16	5	103	94	1	198	57.4	165	198	235	198
	6	11	13	-	24	7.0	204	24	252	24
	7	1	2	-	3	0.9	274	3	266	3
	8	2	4	-	6	1.7	268	6	266	6
	9+	2	2	-	4	1.2	295	4	286	4
Period total		179	165	1	345	100.0	164	345	232	345
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	9	10	-	19	5.0	81	19	189	19
	4	57	30	-	87	22.7	134	87	224	87
6/17- 6/23	5	134	113	-	247	64.5	156	247	234	247
	6	7	8	-	15	3.9	198	15	253	15
	7	1	2	-	3	0.8	224	3	260	2
	8	3	5	-	8	2.1	240	8	269	8
	9+	3	1	-	4	1.0	295	4	285	4
Period total		214	169	-	383	100.0	153	383	232	382
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	46	27	-	73	21.0	77	73	187	73
	4	41	35	1	77	22.1	131	77	222	77
6/24- 6/30	5	83	85	1	169	48.6	159	169	236	169
	6	5	8	-	13	3.7	197	13	253	13
	7	-	1	-	1	0.3	190	1	254	1
	8	5	7	-	12	3.4	238	12	267	12
	9+	-	3	-	3	0.9	259	3	278	3
Period total		180	166	2	348	100.0	141	348	225	348
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
	3	64	44	-	108	7.0	80	108	188	108
	4	211	149	1	361	23.5	145	359	225	361
All periods	5	458	397	2	857	55.8	170	854	236	856
	6	59	62	-	121	7.9	222	121	253	121
	7	4	8	-	12	0.8	261	12	264	11
	8	21	35	-	56	3.6	278	56	272	56
	9+	11	10	-	21	1.4	301	21	280	21
Total		828	705	3	1536	100.0	169	1531	234	1534

Summary of Public Hearing on
Herring FMP in Bethel, Alaska

November 10, 1982

The North Pacific Fishery Management Council held a public hearing on revisions to the Herring FMP in Bethel, Alaska on November 10, 1982. The Council was represented by Rudy Petersen, Leroy Sowl and Clarence Pautzke. The following people attended:

Moses Ayagalria	Napakiak, AK 99634
Paul Kiunya	Kipnuk, AK 99614
John I. Nicori, Sr.	Kwethluk, AK 99621
Raymond C. Christiansen	Bethel Calista Corp.
Axel C. Johnson	Emmonak, AK 99581 Task Force Member
Harry Wilde, Sr.	Mt. Village, AK 99632
Issac Hawk	Eek, AK 99578
Ralph Horn	Bethel, AK 99559
Frank Demantle, Sr.	Kuskokwim United Fishermen Assn.
Ron Southern	Bethel, AK 99559
Mark John	United Village of Nelson Island
Paul John	United Village of Nelson Island
Jack Williams	Mekoryuk, AK 99630
Norman Cohen	Nunam Kitlutsisti
Stella Davey	Alaska Native Foundation Fisheries Program
Nels Alexie	Kuskokwim Community College P.O. Box 368 Bethel, AK 99559
George Hert	YKHC, Bethel, AK 99559
Mike Williams	AVCP Fisheries Task Force
DeeDee Jonrowe	ADF&G, Bethel, AK 99559
Tony Vaska	State Representative
John R. Stone	Chevak, AK 99563
John Paul Jones	Nunam Kitlutsisti
Jesse Foster	Quinhagak, AK 99655

The following comments were received at the hearing:

Paul Kiunya, Sr.: Herring populations are low at Kipnuk and he strongly opposes an offshore fishery which might recreate problems associated with the Japanese fishery of the past. He is a subsistence user and does not want the stocks intercepted offshore. Commercial uses of herring are becoming important too.

Ralph Horn: Everybody opposes offshore fishing on mixed stocks.

Harry Wilde, Sr.: Against offshore fishery because it would intercept herring used locally. Chevak, Hooper Bay, and Seammon Bay derive cash income from the commercial herring fishery. These inshore fisheries must not be hurt.

Axel Johnson: Subsistence is a way of life for natives. Subsistence is their main source of food and must be protected.

Jesse Foster: Biological information is lacking on the impacts of an offshore fishery and management is more political than biological. Must keep harvest inshore. Does not support a high seas fishery. Made point that all age classes are used in the estimation of biomass but 1-3 year olds are too small to catch in gillnets. This could result in perceived underharvest.

John Stone: He asked how an offshore fishery would benefit the inshore fishery. He was concerned about the Board of Fisheries guidelines at Cape Romanzof.

Paul John: Subsistence is important to native village uses. Fish stocks were low at one point and only small herring came back. Nelson Island people use herring as food and are not in favor of offshore interceptions. Herring resource is as important to Nelson Islanders as having a steady job.

John Paul Jones: FMP revision was not delivered in time for adequate review. Natives need cash base to buy equipment, fuel and clothing and are just getting into the commercial herring fishery. He fears that an offshore allocation will hurt this developing source of much needed cash.

Ray Christiansen: He questioned the conditions under which the Regional Director and ADF&G could open an offshore fishery north of 55°47'N before July 1 in Section 2.5.2.

Norman Cohen: The local concern is to protect the northern stocks. FMP revision moves in the right direction but does not go far enough. There is no recognition that fish not caught one year will come back to spawn another year and therefore are not surplus. He is still strongly opposed to any offshore fishery as long as it is necessary to limit the inshore fishery.

The Association of Village Council Presidents passed a resolution calling on the North Pacific Council to reject those portions of the FMP which authorize a high seas trawl fishery for herring (see attachment).

ASSOCIATION OF VILLAGE COUNCIL PRESIDENTS
FISHERIES TASK FORCE

REQUESTING THE NORTH PACIFIC FISHERY MANAGEMENT COUNCIL NOT TO ACCEPT PORTIONS OF THE BERING/CHUKCHI SEA HERRING PLAN WHICH PROVIDES FOR AN OFFSHORE, HIGH SEAS TRAWL HERRING FISHERY

WHEREAS, the Association of Village Council Presidents Fisheries Task Force is made up of representatives of the fishing industry from throughout the Yukon-Kuskokwim Delta; and

WHEREAS, the North Pacific Fisheries Management Council is presently considering a Bering/Chukchi Sea Herring Management Plan which includes provisions for an offshore, high seas, trawl herring fishery on mixed stocks of herring which winter in the eastern Bering Sea; and

WHEREAS, there are coastal villages of the Yukon-Kuskokwim Delta which rely upon the herring stocks of the eastern Bering Sea for their nutritional needs, especially in the villages of Nelson Island and vicinity; and

WHEREAS, the herring resource is becoming an important source of income for some coastal villages because of the new commercial herring fisheries in the Cape Romanzof and Cape Newenham areas; and

WHEREAS, when high seas herring fishing was conducted in the early 1970's, primarily by the Japanese and Russian fishing vessels, there was an extreme reduction in the amount of herring which spawned along the Yukon-Kuskokwim delta; and

WHEREAS, this reduction caused a hardship on those villages which rely upon the herring for food; and

WHEREAS, fishing on mixed stocks of herring can be very dangerous to the continued health of the resource, especially to the smaller herring stocks which spawn north of Cape Newenham, but which commingle with the larger Bristol Bay stock on the high seas during the winter months; and

WHEREAS, herring which are not harvested in the inshore subsistence and commercial fisheries will return again to the spawning grounds in later years and will again be available for harvest there.

NOW THEREFORE BE IT RESOLVED that the ASSOCIATION OF VILLAGE COUNCIL PRESIDENTS FISHERIES TASK FORCE requests that the North Pacific Fishery Management Council reject those portions of the Bering Chukchi Sea Herring Management Plan which authorize a high seas, trawl herring fishery.

Dated: November 11, 1982

Vice - Chairman

Secretary

AGENDA D-2 SUPPLEMENT
DECEMBER 1982

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF COMMERCIAL FISHERIES

STATEWIDE HERRING MANAGEMENT WORKSHOP REPORT TO THE ALASKA BOARD OF FISHERIES

Anchorage, Alaska
December 1982

STATEWIDE HERRING MANAGEMENT WORKSHOP REPORT

Introduction

The recent increase in Alaska's herring harvesting activities has brought about increased demands on the Board of Fisheries and the Department's managers alike. The Board of Fisheries, charged with the responsibility to fairly allocate the harvestable surpluses to competing users and gear groups must attempt to do so in a practical manner to ensure orderly fisheries and not to jeopardize the health of the resource. The Department managers must ensure harvest levels are sustainable and do not interfere with the reproductive needs of contributing stocks. These separate, but interrelated, responsibilities must be highly coordinated if the common management objectives are to be achieved. Increased fishermen participation and gear efficiency in several of Alaska's herring fisheries have compelled the State to fine tune regulations and management strategies. During the 1981 December and 1982 January Board of Fisheries proceedings some differences were perceived in management strategies that were being used in various areas of the State. Concern was expressed by the Board that perhaps a more consistent management approach would be desirable.

The Department concurred with the Board and agreed to convene an intradivisional herring management workshop to review and evaluate the strengths and weaknesses of our herring management program and to formulate recommendations for the Board's consideration. The workshop was subsequently held the last week of October in Anchorage with 32 Department scientists attending the two day session.

This report summarizes the major items addressed at the workshop, the important points raised during the panel discussions and a proposed herring management policy.

Summary of Panel Discussions

The workshop was structured into a series of four discussion panels set up to address major elements of herring management. The first panel was charged with reviewing and evaluating stock exploitation strategies that determine the surplus that can be harvested from a stock. Consideration was given to the need and value of varying exploitation levels according to stock status and to alternative exploitation strategies when a specific exploitation rate cannot be applied due to limited data.

The following points of agreement were reached.

1. Herring should not be managed at the MSY level (although calculations to determine the theoretical yield under various stock conditions would certainly provide useful information for setting exploitation rates).

2. If stock assessments are made, the exploitation rate should vary from 0 to 20% of the mature stock. Harvest of immature herring should be avoided.

3. If stock assessments are not made, a harvest ceiling should be set based upon historical sustained yield or other available information. A wide open fishery without harvest ceilings is to be avoided.

4. Specific criteria for determining actual exploitation rates should include the following.

   a. Stock abundance, e.g. the high end of the range of exploitation is warranted if stock is increasing or stable at what is considered an acceptably high level of abundance;

   b. Age composition. It is desirable to maintain several age classes within a stock to dampen recruitment fluctuations.

   c. Spawner-recruit relationship. Although this relationship is usually not well described, it is desirable to maintain a minimum level of spawning biomass, below which no harvest will be allowed, to avoid recruitment overfishing.

5. All harvests from the same stock must be included in calculations of acceptable exploitation rates. No "double dipping" should be allowed in any stock, i.e. harvests for sac roe, spawn on kelp, and food/bait within a single stock must fall within either an exploitation rate of 0-20% or the fixed ceiling for any one fishing year.

Much discussion was generated over determining the actual exploitation rate to use when trying to pick a value between 0-20%. No general consensus could be reached in providing a set method, although it was agreed that the general principles outlined in 4 a-c above should be followed. Even so, the actual inseason management techniques only allow for relatively inexact achievement of set goals, e.g. attempts to obtain E=10% would actually achieve 10% $\pm$ x%. Therefore, it should be most important to first decide whether a harvest should be allowed, and then determine whether the allowable harvest should be set to achieve either a "low" (10% $\pm$ 5%) or a "high" (20% $\pm$ 5%) exploitation rate.

In general, it was felt that the unknown accuracy of assessments and poorly described biological relationships for most stocks were good reasons for holding maximum exploitation rates to 20%. Other evidence suggests that the 20% exploitation rate may be conservative enough to use as an upper

limit for herring harvests. Generally, natural mortality rates increase with increasing age. Estimated annual natural mortality rates range from 18% at age 3 to 57% at age 8 in British Columbia and Southeast Alaska herring populations (Skud 1963, Tester 1955) and are thought to average 38% for Bering Sea herring (Wespestadt 1978). Imposing a 20% exploitation upon such populations would result in total annual mortalities ranging from 34% at age 3 to 66% at age 8 for southern stocks and averaging 50% for northern stocks. Since a maximum fishing mortality of 20% is equal to or less than most estimated natural mortality rates, a 0-20% exploitation should ensure that each age class remains within a population for several years.

The second discussion panel, entitled "Management Strategies to Achieve Exploitation Objectives and Board of Fisheries Allocations" considered the value and limitations of management strategies currently employed by the Department. The following consensus was reached on the major items discussed.

Emergency Order vs. Set Seasons. There should be no attempt to apply a universal approach to all fisheries and all situations. The decision to use one strategy over the other should depend on an evaluation of each fishery. The merits or disadvantages of each approach vary and may change through time as the fishery develops. Although the tendency has been to evolve from a system of set seasons to an eventual emergency order approach, this should not become a requirement.

The following are important factors to consider when evaluating an emergency order strategy.

1. The emergency order approach is most useful in fully developed fisheries where the potential for rapid harvest exists. Stocks involved are usually concentrated in a small area and can be readily defined and assessed.

2. The emergency order approach is not applicable in situations where stocks are small, mixed, scattered over broad geographical areas, and cannot be economically assessed and evaluated. Set seasons in these situations tend to promote the most orderly harvest and can spread it out over time and area. Usually fixed seasons are better in fisheries with small stocks with more or less static harvest ceilings and low effort. In some instances this can permit exploration and gradual development of otherwise unutilized stocks.

3. Requiring the use of emergency order management in fisheries with multiple gear types that are not separated by time or area can result in unintentional allocation between users because it tends to compress the harvest into a short time and the most efficient gear type will always have the advantage.

Allocation Strategies. There are presently no gear or user group allocation schemes that significantly limit management's ability to provide proper conservation of the stocks. Future reallocations or adjustments in

the harvests for adjacent fisheries of different market types (bait vs. sac roe) should be handled cautiously. More conservative approaches will be required if solid data is not available on the composition and potential double jeopardy of the affected stocks.

Strategies to Optimize Product Value. Due to the nature of herring roe fisheries, management actions often have a direct effect on product value and allocation among competing users. Strategies which attempt to optimize product value must be carefully considered so that all users may benefit equally. Decisions to implement management strategies to optimize product value should be made by the Board of Fisheries and take into account the variability of conditions that may be common to the fishery.

Situations where value can be optimized and the conditions that should exist.

1. Fishery ordinarily will be large, intense, and with concentrated stocks.

2. Consensus of all processors and fishermen must be possible.

3. Sampling effort must be intense.

4. Calculations of recovery should be done by industry and not by the Department.

5. There is one specific situation where management could determine the product value. This would be where a fishery was closed to minimize the wastage or dumping of unmarketable fish, e.g., the dumping of immature or spawned out fish caught in gill net gear.

Pitfalls or situations where it is difficult to optimize product value.

1. It places an undue responsibility on the Department because optimizing market value requires making socioeconomic decisions. The staff does not normally consider or collect this type of economic data.

2. Trying to optimize value tends to concentrate the harvest until just prior to spawning and can result in the exceeding of capacity, or the harvest could be lost entirely due to weather or other factors. It can contribute to a wider range of error in management and could defeat efforts to conduct an orderly harvest.

3. There normally are different roe recovery requirements among buyers depending on their markets.

4. Where gear is not separated by time or area, trying to maximize value will result in unintentional allocation between the different gear types with the advantage going to the most efficient.

5. Because of the existence of fisheries where stocks can be of mixed maturities, it would be impossible for the Department to optimize value, in a gill net fishery especially.

Value of Herring as Food for Other Commercial Species. Although the importance of herring as a forage fish for other commercially important species is recognized, there is no hard data available to measure this and make a specific allowance for the need in developing appropriate harvest strategies. In the absence of this data, current harvest rates are maintained at conservative levels to allow for this and other needs. Minimum threshold levels have also been established, where possible, to safeguard against stock depletion and failure.

A third discussion panel addressed the question of what constitutes a "stock" and evaluated the current assessment techniques used to describe stock size.

Stock Definition. The task of defining "stock" for management purposes as it would apply to herring populations proved to be a difficult one. While it appeared that no single definition uniformly fit managers' needs for all areas in the State, the definition used by the Canadians and the Southeastern staff was generally thought to be the best for management purposes. The definition states: "A stock is defined as a concentration of herring occupying the same distinct fishing ground during the fishing season over a succession of years." Clearly, the important element of defining a herring stock is to prevent double jeopardy harvests between various fisheries on a particular stock. Refinements in the stock concept will be attainable as the Department gains knowledge and understanding of herring populations through stock separation studies and age class composition comparisons.

Biomass Assessment. Methods of stock measurement were discussed in detail with the associated limitations identified for the various techniques used. In general, aerial assessments are influenced by air and sea conditions, spotter experience, herring schooling behavior, on the ground calibrations, species diversity, and conversion of instantaneous counts to seasonal counts. Even with these limitations aerial assessments are considered a viable method of assessment in the right circumstances. Research needed to strengthen this approach in areas where applied include tagging studies, increased calibration of survey estimates to biomass, and on the grounds species determination.

The use of hydroacoustic equipment to assess herring abundance was extensively discussed. Present hydroacoustic assessment gear used in Southeastern and Prince William Sound work well for stocks that form predictable concentrations in the same general locations in deep water from year to year but lack the ability to assess herring in rapidly fluctuating situations in shallow water. Other types of hydroacoustic gear now available on the market are more versatile and may provide solutions to assessment problems in the more dynamic situations common to other areas of the State. Workshop attendees were shown a number of new units capable of abundance assessment applications. Feasibility tests will be attempted as funding will allow.

The fourth discussion panel entitled "Need and Value of Developing a Consistent Statewide Management Strategy/Policy" was the focal point of the two day workshop. The panel reviewed prior Board of Fisheries policy statements on herring, policy statements addressing other pertinent fisheries, and the current herring management practices of the Department. The panel concluded that a statewide policy statement on herring management was necessary to assure a level of consistency in current area management practices. Of particular concern was clearly defining the responsibilities of the Board and Department. Hence, the draft statement attempts to specify the responsibilities of both entities. The policy panel focused on four major management concerns: 1) harvesting strategies which provide guidance and flexibility for existing as well as developing fisheries, 2) general principles of product quality and standards which are adopted by the Board and implemented inseason by the Department, 3) management and allocation problems resulting from mixed stock fisheries, and 4) conservation consequences of multiple annual harvests on a single stock. Findings of the first two panels, "Stock Exploitation Strategies" and "Management Strategies to Achieve Exploitation Objectives" were reviewed and formed the key elements of the draft policy statement presented in this report.

APPENDIX I.

DRAFT

ALASKA BOARD OF FISHERIES

AND

ALASKA DEPARTMENT OF FISH AND GAME

POLICY ON HERRING RESOURCE MANAGEMENT

The purpose of this statement is to inform the public on the management of Alaska's herring fisheries. This policy is intended to consolidate and unify previous Board policies and Department practices on statewide herring management. The policy is necessitated by the recent, rapid expansion of the herring fishery, especially for roe extraction. Many new herring fisheries have developed, often without adequate biological information necessary for management. Fishing effort and efficiency has increased in individual herring fisheries and user group conflicts exist. Enforcement is generally minimal or nonexistent in many fisheries. In view of the above factors, a conservative yet flexible approach is required to manage the herring fisheries.

The primary task of the Department is to manage the herring stocks based on biological considerations while executing the harvest strategies of the Board. Harvest strategies which optimize economic return, establish criteria for product quality, and allocate the harvest among competing user groups are the purview of the Board. These strategies for specific herring fisheries are governed by policy, regulation, or area management plans approved by the Board. The Department will manage the herring fisheries of the State following the guidelines set forth by the Board. As needed, the Department will prepare news releases to better inform the public on the conduct of specific fisheries.

The policy of the State is to encourage the full utilization of the Alaska herring resource by harvesting the Optimum Yield (OY) and allocating such harvest among beneficial uses. When allocating harvest the Board will take into consideration any customary and traditional subsistence uses of herring. The herring OY is that level of harvest which ensures the sustained yield of the resource and establishes stability by eliminating, as much as possible, extreme fluctuations in annual harvest. The Board recognizes that this policy will produce an OY which is probably less than the maximum physical yield.

Achievement of this management objective depends upon the maintenance of herring stocks that are comprised of various age classes rather than creating a fishery dependent upon recruitment. Maintaining a controlled harvest on several year classes will reduce fluctuations associated with variable recruitment. The benefits of maintaining several large year classes in the fishery are most apparent when weak year classes enter the fishery. When year classes have been partially protected by controlling harvest rates, there will be enough older herring to reduce the decline in catch and maintain adequate brood stock.

The goal of full utilization of the Alaska herring resource requires both the collection of adequate scientific information on the resource and capitalization of the harvesting and processing sectors. As more scientific information is available to describe a fishery, the harvest should be adjusted to a level which reflects that increased knowledge. In situations where scientific data are poor, the harvest should be more conservative to reflect the concern for overfishing. The Board directs the Department to formulate conservative harvest limits for those fisheries, particularly developing fisheries, where little scientific information is available. This conservative management strategy will allow the industry the opportunity to develop new herring fisheries while minimizing the risks of overcapitalization. As new information is collected then the harvest strategy may be liberalized.

Depending upon the level of information available to describe a specific herring resource, one of two techniques may be employed to set the amount of harvest. In situations where a herring stock can be adequately assessed, the harvest will be based upon applying certain exploitation rates to individual herring stock levels. Exploitation rates on individual herring stocks may vary from zero to twenty percent, depending on such factors as the size of the stock (relative to historical averages), the age composition of the stock, the amount of spawn the stock has produced and the number and type of fisheries that may occur on a stock. Exploitation rates at the low end of the range should be applied to small stocks and those that contain younger age classes of mature herring which will return to spawn in succeeding years. Conversely, exploitation rates at the high end of the range should be applied to large stocks and those which contain multiple age classes, especially older age classes that may be lost to succeeding harvests due to natural mortality. Minimum levels of biomass (based on a spawner recruitment relationship or other appropriate methodology) should be established to assure that reproductive requirements will be met prior to allowing a fishery to occur. A lower harvest rate may also be necessary where a stock of herring may be utilized for other beneficial uses (e.g. as a forage fish for other commercially valuable species, a major subsistence fishery, or a roe-on-kelp fishery). A maximum twenty percent exploitation rate may be applied to an individual stock in any one fishing year. This rate reflects uncertainties of variable recruitment and natural mortality vis a vis the socioeconomic goal of producing the optimum yield. In those situations where herring stocks cannot be adequately assessed, then harvest levels should be established. These levels should be based on average catches, historical harvest levels, or other appropriate methods. Additionally, harvest quotas may be established to allocate a portion of the harvest for specific uses.

The development or expansion of mixed stock herring fisheries and those fisheries which occur upon stocks which have been previously fished in that year, are discouraged. Except in situations where adequate scientific

information is available to prevent the overharvest of discrete stocks, existing mixed stock or multiple harvest fisheries should be eliminated or significantly reduced.

Management measures, such as opening and closing of fishing seasons and areas, and allowable fishing time, should be employed to minimize wastage of herring. However, processors and fishermen should ensure that sufficient processing capacity and markets exist prior to fishing to avoid potential wastage. It is recognized that wastage may occur due to unavoidable situations such as storms, spawning conditions, and processing problems.

When opportune, the Board may develop specific management plans which optimize herring product quality (e.g., roe percentages, size of fish, oil and fat content). Criteria for determining product quality will be developed by the Board and implemented by the Department. However, it is recognized that unforeseen or unpredictable circumstances such as weather or spawning conditions may result in reduced product quality or harvests.

APPENDIX II.

List of Herring Workshop Participants, October 25, 1982.

Name	Home Office
Paul Ruesch	Soldotna
Dennis Haanpaa	Anchorage
Keith Schultz	Bethel
Craig Whitmore	Anchorage
Robert Larson	Ketchikan
Bob DeJong	Sitka
Dennis Blankenbeckler	Ketchikan
William Bergmann	Petersburg
Mac Minard	Dillingham
Richard Randall	Cordova
Don Ingledue	Juneau
Jeff Skrade	Dillingham
Paul Pedersen	Kodiak
Tom Schroeder	Homer
Larry Malloy	Kodiak
Lee Hammarstrom	Homer
Arnold Shaul	Kodiak
Scott Marshall	Anchorage
Paul Larson	Juneau
Len Schwarz	Nome
Charles Lean	Nome
Dave Gaudet	Juneau
Ken Parker	Juneau
Bob Clasby	Juneau
Daniel Bergstrom	Anchorage
Dee Dee Jonroe	Bethel
Stephen Fried	Anchorage
Mike Geiger	Anchorage
Ken Florey	Anchorage
Pete Fridgen	Cordova
Alan Kingsbury	Anchorage
Fred Gaffney	Juneau

STATE OF ALASKA
JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF FISH AND GAME
OFFICE OF THE COMMISSIONER

P.O. BOX 3-2000
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PHONE:

REPORT TO THE ALASKA BOARD OF FISHERIES AND NORTH PACIFIC FISHERY MANAGEMENT COUNCIL CONCERNING BERING SEA/ALEUTIAN ISLANDS HERRING MANAGEMENT

Following is a brief summary of three attached reports:

(a). The 1982 Bering Sea Coastal herring summary

The Bering Sea coastal herring fishery includes the fishing districts of Togiak, Goodnews Bay, Security Cove, Nelson Island, Cape Romanzof, and Norton Sound. The commercial fishery began May 14 in the Togiak district and progressed northward with the last delivery made June 10 in the Norton Sound district. Total commercial harvest was 24,897 mt. Additionally, the spawn on kelp fishery harvested 141.4 mt. Ex-vessel value was estimated at $7.9 million. Average price paid to the fishermen was $300 to $400 per mt. Nelson Island subsistence harvest was 97 mt. Total biomass of the commercially exploited stocks was 116,000 mt; the overall exploitation rate during the roe fishery was 21.5%. The Nelson Island biomass was estimated at 3,600 mt. Four and five year old fish dominated the spawning biomass. Age 5 fish comprised approximately 56% of the harvest; age 4 comprised about 17% of the catch. The outlook for the 1983 season is generally similar or somewhat less than 1982. There is no indication that good recruitment can be expected.

(b). The 1982 Aleutian Islands Coastal herring summary

During 1981, 639 mt of herring were harvested in the Aleutian Islands, the first such landings since the fishery ended in 1945. The 1982 harvest which was sold as food and bait, was 3,234 mt. This harvest, by seven seine vessels, occurred in State waters between August 5 and September 12. Average price was approximately $300 per mt; total ex-vessel value was approximately $1 million. Herring was delivered to Dutch Harbor and Unalaska processors. No biomass estimates were made. The catch was dominated by age 5 herring.

(c). Aleutian Islands herring stock separation study

Due to rapid development of the Aleutian Island food and bait herring fishery during August and September 1982, significant concerns over the origin of stocks necessitated an intensive short term research study. The Department contracted with the University of Washington's Fisheries Research Institute to evaluate stock of origin in the Aleutian Island fishery using scale pattern analysis. Scale patterns and back calculated lengths were used to classify age 5 herring caught in the Dutch Harbor food and bait fishery to stock of origin. Five standards were used: Norton Sound, Cape Romanzof, Nelson Island, Togiak, and Port Moller. Norton Sound and Cape Romanzof fish were not detected in the Dutch Harbor samples. Overall classificatory accuracy was 73.4% for a three way analysis using Nelson Island, Togiak, and Port Moller stocks. Point estimates for the origin of all Dutch Harbor age 5 herring scales were 43.3% Togiak, 35.4% Nelson Island, and 21.3% Port Moller, with broadly overlapping 90% confidence intervals.

PACIFIC HERRING STOCKS AND FISHERIES IN THE EASTERN BERING SEA, ALASKA, 1982

A Report to the North Pacific Fisheries Management Council

November 1982

Prepared by:

Stephen M. Fried,
Craig Whitmore,
and
Daniel Bergstrom

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Division of Commercial Fisheries
333 Raspberry Road
Anchorage, Alaska 99502

This report summarizes current information on eastern Bering Sea Pacific herring stocks and fisheries within Alaskan waters. A more detailed account of this information is presented in Fried et al (1982).

COMMERCIAL FISHERIES

A total of 24,897 m.t. of Pacific herring were harvested in eastern Bering Sea Commercial Fishing Districts during 1982 (Figures 1 and 2, Table 1). This was the largest total harvest recorded since these fisheries began in the 1960's. Exploitation of estimated available spawning biomass was 21.5% (Table 2). Wastage of herring was estimated to be less than 500 m.t. for all Districts combined. Most documented wastage was due to storms and vessel mishaps rather than to dumping of unwanted herring. Numbers of buyers and fishermen increased in Togiak District, but decreased in all other Districts (Table 3). Spawn on kelp harvests in Togiak and Norton Sound Districts totaled 141.4 m.t. (Table 4). Value of total herring and spawn on kelp harvests to fishermen was estimated to be $7.9 million.

A total of 2,939 m.t. of herring was also harvested in the vicinity of Unalaska Island during 1982 (Table 1). Studies are currently underway to determine whether herring harvested during this fishery belong to stocks which spawn and are harvested in Togiak, Security Cove or Goodnews Bay Districts.

SUBSISTENCE FISHERIES

A total of 97 m.t. of Pacific herring were harvested by 129 families from seven villages in the Nelson Island and Yukon-Kuskokwin Delta area (Table 5).

STOCK ASSESSMENT

Methods

Aerial surveys were conducted within all Fishing Districts, except Cape Romanzof, to determine relative abundance, distribution and estimated biomass of herring schools. Basic methods of data collection were similar to those used in previous years (Barton and Steinhoff 1980). A total of 172 hours was spent in aerial assessment of herring spawning stocks: 63 hours in Togiak, 28 hours in Security Cove/Goodnews Bay, 6 hours in Nelson Island and 75 hours in Norton Sound. In-season stock size estimates could only be made for Togiak and Norton Sound Districts due to weather and water conditions. Post-season estimates were made for the remaining Districts based upon catch rates and spawn deposition during the season (Table 6).

Availability of a chartered helicopter on the Togaik fishing grounds greatly aided test fishing, catch sampling, fishery monitoring and assessment activities. Unfortunately, mechanical failures prevented use of the helicopter during most of the time period chartered purse seine vessels were available; tonnage data on only one herring school was obtained during the season (Table 7). Conversion factors of 1.2 (water depth 5 m or less), 2.5 (water depth greater than 5 m) and 3.0 (water depth greater than 8 m) per 50 m^2 school surface area were used in analysis of Togiak District aerial survey data. Conversion factors of 2.4 or 3.1 m.t./50 m^2 were used for all other Districts.

Test fishing with variable mesh gillnets and sampling of commercial landings were conducted in all Fishing Districts to determine age, size and sexual maturity of herring. Additionally, chartered purse seine vessels were used to collect herring samples within Togiak District. A total of 10,739 herring was sampled during 1982.

Results

Spawning populations in most Districts were lower than those observed in 1981 (Table 6). A total of 119,600 m.t. of herring was estimated to have been present during the 1982 spawning season. Spawn deposition was similar to that observed in 1981, with totals of 66, 8 and 37 linear km of milt sighted during aerial surveys in Togiak, Security Cove and Norton Sound Districts, respectively. Age composition analyses indicated that five year old herring (1977 year class) comprised 55% of the total spawning population (Figures 3 and 4). Four year old herring (1978 year class) comprised 18% of the spawning population.

Peak periods of herring abundance occurred 19-23 May in Togiak District, 25-30 May in Security Cove and Goodnews Bay Districts, and 6-14 June in the various Subdistricts of Norton Sound District. Ice and cold water temperatures delayed inshore migration and onset of spawning as compared to 1980 and 1981 in all Districts.

OUTLOOK FOR 1983

Based upon a moderate recruitment of four year old herring and the continued large returns of five year old herring in 1982, the Department of Fish and Game anticipates a harvestable surplus of herring to be available in all Districts in 1983. However, since no methods are available to reliably forecast actual returns (or to estimate recruitment), harvest levels will be adjusted during the season according to observed herring biomass. If it is not possible to determine herring abundance by using aerial surveys, stock condition will be assessed using information from test and commercial catches along with spawn deposition observations.

Although increased use of collected fishery statistics in mathematical models may provide useful information for predicting abundance trends of herring populations, further work is needed to refine real time stock assessment techniques. Offshore hydroacoustic and trawl surveys coupled with stock identification studies could provide pre-season stock size estimates. Underwater telemetry or tagging studies could provide needed information on herring movement patterns and spawning ground residence time to refine in-season stock size estimates. Inshore hydroacoustic surveys could provide a more cost effective method of obtaining conversion factor estimates than using chartered purse seine vessels.

LITERATURE CITED

Barton, L.H. and D.L. Steinhoff. 1980. Assessment of spawning herring (Clupea harengus pallasi) stocks at selected coastal areas in the eastern Bering Sea. Alaska Department of Fish and Game Informational Leaflet No. 187. 60 p.

Fried, S.M., C. Whitmore and D. Bergstrom. 1982. Pacific herring stocks and fisheries in the eastern Bering Sea, Alaska, 1982: A report to the Alaska Board of Fisheries. Alaska Department of Fish and Game mimeo. 30 p.

Table 1. Herring and herring spawn on kelp harvests in metric tons by U.S. commercial fishermen in the eastern Bering Sea, Alaska 1909-1982.

Year	Herring 1/						Herring Spawn on Kelp		
	Unalaska Island	Bristol Bay	Security Cove/ Goodnews Bay	Cape Romanzof	Norton Sound	Total	Bristol Bay	Norton Sound	Total
1909-1916	-	-	-	-	2/	2/	-	-	-
1916-1928	-	-	-	-	1,705.6	1,705.6 3/	-	-	-
1929	1,141.9	-	-	-	151.3	1,293.2	-	-	-
1930	1,738.2	-	-	-	399.7	2,137.9	-	-	-
1931	957.9	-	-	-	78.2	1,036.1	-	-	-
1932	2,726.9	-	-	-	480.0	2,756.9	-	-	-
1933	1,438.2	-	-	-	27.8	1,466.0	-	-	-
1934	1,390.9	-	-	-	3.5	1,394.4	-	-	-
1935	2,188.0	-	-	-	14.1	2,202.1	-	-	-
1936	1,251.1	-	-	-	-	1,251.1	-	-	-
1937	525.4	-	-	-	5.0	530.4	-	-	-
1938	465.5	-	-	-	9.0	474.5	-	-	-
1939	-	-	-	-	5.0	5.0	-	-	-
1940	-	-	-	-	12.7	12.7	-	-	-
1941	-	-	-	-	3.4	3.4	-	-	-
1942-1944	-	-	-	-	-	-	-	-	-
1945	68.0	-	-	-	-	68.0	-	-	-
1946	-	-	-	-	-	-	-	-	-
1947-1963	No Commercial Operations Reported								
1964	-	-	-	-	18.1	18.1	-	-	-
1965	No Commercial Operations Reported								
1966	-	-	-	-	10.8	10.8	-	-	-
1967	-	122.0	-	-	-	122.0	-	-	-
1968	-	82.4	-	-	-	82.4	24.8	-	24.8
1969	-	42.8	-	-	2.0	44.8	4.6	-	4.6
1970	-	25.0	-	-	7.3	32.3	17.6	-	17.6
1971	-	-	-	-	17.7	17.7	23.5	-	23.5
1972	-	73.7	-	-	15.3	89.0	29.1	-	29.1
1973	-	46.3	-	-	32.3	78.6	5.3	-	5.3
1974	-	111.7	-	-	2.4	114.1	57.0	-	57.0
1975	-	50.4	-	-	-	50.4	50.4	-	50.4
1976	-	-	-	-	7.7	7.7	134.1	-	134.1
1977	-	2,534.9	-	-	9.5	2,545.4	125.1	Trace	125.1
1978	-	7,030.4	259.0	-	13.6	7,303.0	149.6	3.4	153.0
1979	-	10,115.3	466.0	-	1,173.0	11,754.3	188.0	11.8	199.8
1980	-	17,774.0 4/	1,039.0	554.0	2,215.4	21,600.3	86.0	22.2	108.2
1981	639	11,374.3	1,660.2	653.2	3,964.5	18,291.2	171.9	37.2 6/	209.1
1982 5/	2,939	19,556.0	1,178.0	596.0	3,567.0	27,836.0	106.5	34.9	141.4

1/ Prior to 1964 majority of herring catch was taken in summer and fall for food market; since 1964 majority of herring catch was taken in spring primarily for marketing of roe.
2/ Fishery occurred some years, but harvests unavailable.
3/ Total catch for all years.
4/ There was an additional estimated 5,200 m.t. of wastage.
5/ Preliminary data.
6/ Does not include 5 m.t. dumped (unmarketable or no market when harvested).

Table 2. Estimated biomass and commercial harvest of Pacific herring in eastern Bering Sea fishing Districts, Alaska, 1978-1982.

District		Biomass (m.t.)	Harvest (m.t.)	Roe %	Estimated Value (dollars)	% Biomass Harvested
1982						
	Togiak	88,800	19,556	8.8	6,174,300	22.0
	Security Cove	4,600	737	9.3	271,000	16.0
	Goodnews Bay	2,400	441	9.5	187,900	18.4
	Cape Romanzof	4,400	596	9.3	221,700	13.6
	Norton Sound	15,800	3,567	8.8	1,046,200	22.6
	Total	116,000	24,897	8.9	7,630,100	21.5
1981						
	Togiak	143,900	11,374	9.1	3,988,000	7.9
	Security Cove	7,500	1,064	8.1	347,070	14.2
	Goodnews Bay	3,900	596	7.7	196,170	15.3
	Cape Romanzof	4,400	653	8.0	211,260	15.0
	Norton Sound	22,800	3,965	8.8	1,500,000	17.3
	Total	182,500	17,652	8.9	6,242,500	9.7
1980						
	Togiak	62,300	17,774 1/	9.2	3,205,000	28
	Security Cove	1,100	632	8.2	151,000	57.
	Goodnews Bay	1,100	406	9.5	97,000	36.9
	Cape Romanzof	2,700	554	9.8	132,000	20.5
	Norton Sound	7,600	2,224	8.1	500,500	29.3
	Total	74,800	21,590	8.8	4,085,500	28.9
1979						
	Togiak	216,800	10,115	8.6	6,700,000	4.7
	Security Cove	19,500	385	8.5	327,000	2.0
	Goodnews Bay	6,700	82	4.7	38,500	1.2
	Cape Romanzof	2,700	0	-	-	0.0
	Norton Sound	7,000	1,172	7.0	628,200	16.7
	Total	252,700	12,406	8.0	7,694,000	4.9
1978						
	Togiak	172,600	7,033	8.2	2,300,000	4.1
	Security Cove	1,200	259	-	-	21.6
	Goodnews Bay	400	0	-	-	0.0
	Cape Romanzof	2,700	0	-	-	0.0
	Norton Sound	4,800	13	-	-	0.3
	Totals	181,700	7,305	8.2	2,300,000	4.0

1/ Does not include an estimated 5,200 m.t. of waste.

Table 3. Commercial harvest of Pacific herring spawn on rockweek kelp in eastern Bering Sea Fishing District, Alaska, 1978-1982.

	District	Harvest (m.t.)	Number of Buyers	Number of Pickers	Estimated Value (Dollars)
1982					
	Togiak	106.5	8	214	176,193
	Norton Sound	34.9	1	74	57,585
	Total	141.4			233,778
1981					
	Togiak	171.9	7	108	250,000
	Norton Sound	37.2 1/	4	22	45,000 2/
	Total	209.1			295,000
1980					
	Togiak	86.0	21	78	94,600
	Norton Sound	22.2	1	20	73,000
	Total	108.2			167.600
1979					
	Togiak	188.0	16	100	248,160
	Norton Sound	11.8	1	19	15,576
	Total	199.8			263,736
1978					
	Togiak	149.6	11	160	119,800
	Norton Sound	3.4	1	0	2,723
	Total	153.0			122,523

1/ Does not include 5 m.t. dumped.
2/ Only 14 m.t. marketed, rest lost during tender accident.

Table 4. Numbers of buyers and fishermen participating in eastern Bering Sea Pacific herring fisheries, Alaska, 1978-1982.

	District	Number of Buyers	Number of Fishermen 1/ Gillnet	Number of Fishermen 1/ Purse Seine
1982				
	Togiak	33	200	135
	Security Cove	3	107	*
	Goodnews Bay	3	84	*
	Cape Romanzof	2	75	*
	Norton Sound	7	237	*
1981				
	Togiak	28	106	83
	Security Cove	7	113	*
	Goodnews Bay	5	175	*
	Cape Romanzof	4	111	*
	Norton Sound	13	332	*
1980				
	Togiak	27	363	140
	Security Cove	8	175	*
	Goodnews Bay	4	165	*
	Cape Romanzof	2	69	*
	Norton Sound	8	294	*
1979				
	Togiak	33	350	175
	Security Cove	2	61	*
	Goodnews Bay	1	41	*
	Cape Romanzof		No Fishery Conducted	
	Norton Sound	7	50	17
1978				
	Togiak	16	40	25
	Security Cove	3	-	-
	Norton Sound	1	11	-

** Purse seine gear prohibited.

1/ Refers to # of vessels enumerated during aerial surveys in Togiak District.

Table 5. Subsistence herring catch (in metric tons) and effort data by selected areas, eastern Bering Sea, Alaska, 1975-1982. 1/

Village	1975	1976	1977	1978	1979	1980	1981	1982
				Nelson Island				
Tununak	19.8	13.9	51.9	34.6	31.0	59.2	36.0	43.8
Umkumiut	30.0	8.5	2.8	10.4	7.5	3.1	9.0	0
Toksook Bay	31.0	31.8	19.3	33.5	46.5	26.6	13.0	31.6
Total	80.8	61.2	74.0	78.5	85.0	88.9	58.0	75.4
Number of Fishing Familes	109	42	90	83	54	70	93	65
				Yukon-Kuskokwim Delta				
Scammon Bay	-	0.6	-	0.6	5.4	2.8	6.9	3.5
Chevak	-	0.6	0.1	-	2.1	3.2	1.7	1.8
Hooper Bay	2.5	2.7	2.1	3.5	2.8	3.3	3.6	4.2
Kwigillingok	-	9.6	0.9	-	7.2	12.0	-	12.0 2/
Total	2.5	13.5	3.1	4.1	17.5	21.3	12.2	21.5
Number of Fishing Families	34	49	39	29	106	80	45	64
				Areas Combined				
Total Catch	83.3	74.7	77.1	82.6	102.5	110.2	70.2	96.9
Number of Fishing Families	143	91	129	112	160	150	138	129

1/ Other areas with small catches have been surveyed irregularly (1975-1978 estimated total coastal yearly subsistence catch averaged 100 m.t.).

2/ Estimate based on post season observations.

Table 6. Relative abundance index (RAI) and estimated biomass of eastern Bering S herring, Alaska, 1978-1982.

District	1978	1979	1980	1981	1982
			Relative Abundance Index (RAI) 1/		
Togiak	43,050	137,630	15,249	79,352	49,998
Security Cove	246	2,912	435	2,228	486 3/
Goodnews Bay	241	3,729	3/	1,593	3/
Nelson Island	1,079	3/	3/	1,072	3/
Cape Romanzof	539	3/	3/	4/	4/
Norton Sound	1,277	1,860	2,242	6,516	4,548
Total	46,432	146,131+	17,926+	90,761+	55,032+
			Estimated Biomass in m.t. 2/		
Togiak	172,600	216,800	62,300	143,900	88,800
Security Cove	1,200	19,500	1,100	7,500	4,600 3/
Goodnews Bay	400	6,700 3/	1,100 3/	3,900	2,400 3/
Nelson Island	5,400	5,400 3/	5,400 3/	3,600	3,600 3/
Cape Romanzof	2,700	2,700 3/	2,700 3/	4,400 4/	4,400 4/
Norton Sound	4,800	7,000	7,600	20,800	15,800
Total	187,100	258,100	80,200	186,100	119

1/ Number of fish schools equivalent to 50 m surface area, unadjusted for presence of non-herring pelagic species.

2/ Adjusted for presence of non-herring pelagic species. Estimates for 1978 and 1979 represent low end of estimate ranges from Barton and Steinhoff (1980), 1980 estimates from Kingsbury (1980).

3/ Incomplete data due to inclement weathern and/or turbid waters, biomass estimates are questionable and are based on 1978, 1979 or 1981 data.

4/ No aerial surveys made, 1981 estimate based upon assumption that commercial harvest represented 15 percent of total biomass; 1981 estimate used for 1982.

Table 7. Conversion estimates (metric tons of Pacific herring per 50 m^2 school surface area) obtained from test purse seine fishing, Togiak District, Alaska, 1978-1982.

Year	Water Depth (m)	Biomass per RAI unit	(m.t./50 m)
1981	2	1.1	Catch Landed
1980	3	1.2	Catch Landed
1980	5	1.1	Catch Landed
1980	5	1.2	Catch Estimated in Net
1979	6	2.4	Catch Landed
1980	6	3.0	Catch Estimated in Net
1980	6	2.6	Catch Estimated in Net
1981	6	1.7	Catch Landed
1980	8	1.6	Catch Estimated in Net
1981	8	4.0	Catch Landed
1982	8	1.9	Catch Estimated in Net
1978	?	6.7	Catch Estimated in Net
1978	?	11.0	Catch Estimated in Net

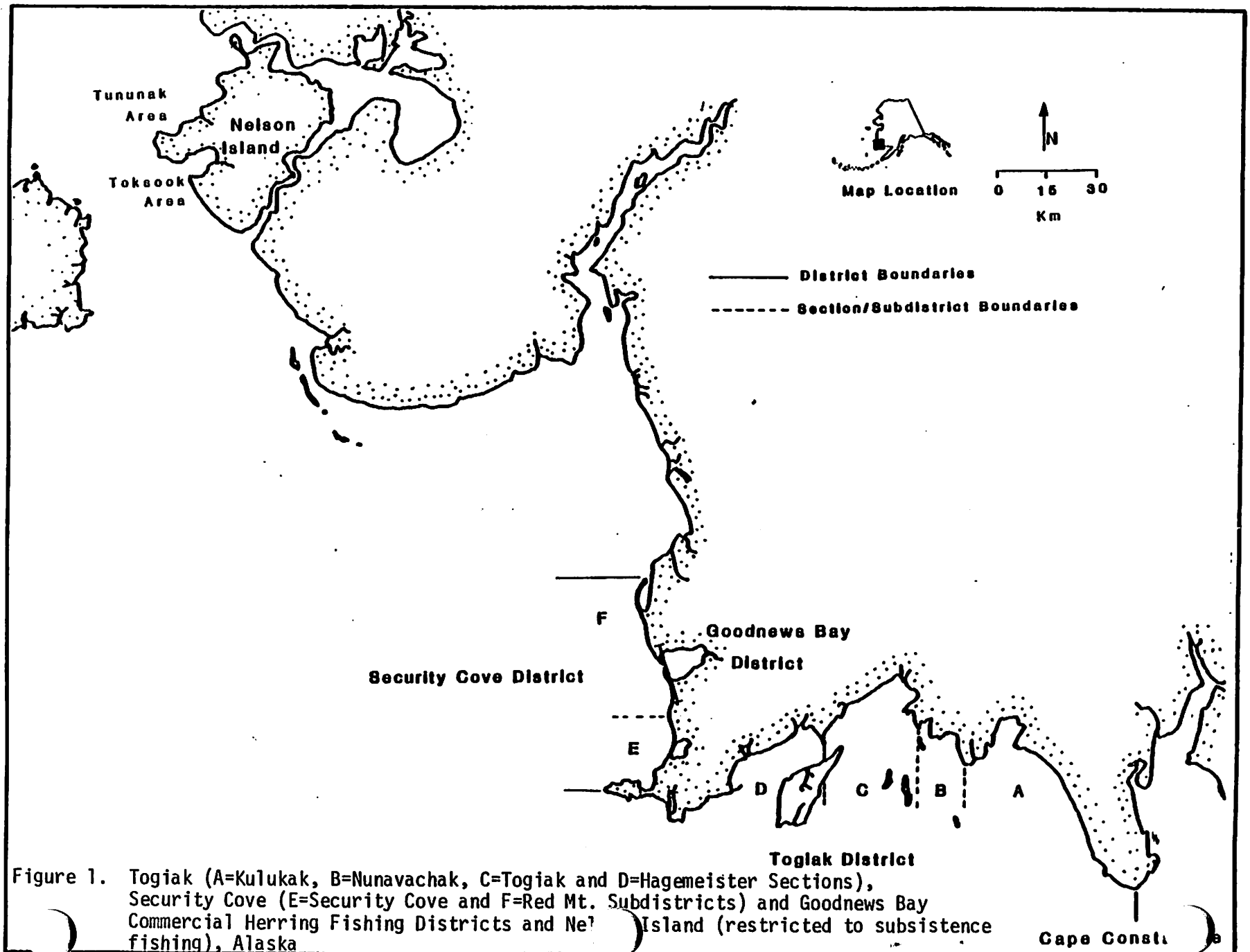

Figure 1. Togiak (A=Kulukak, B=Nunavachak, C=Togiak and D=Hagemeister Sections), Security Cove (E=Security Cove and F=Red Mt. Subdistricts) and Goodnews Bay Commercial Herring Fishing Districts and Ne[illegible] Island (restricted to subsistence fishing), Alaska

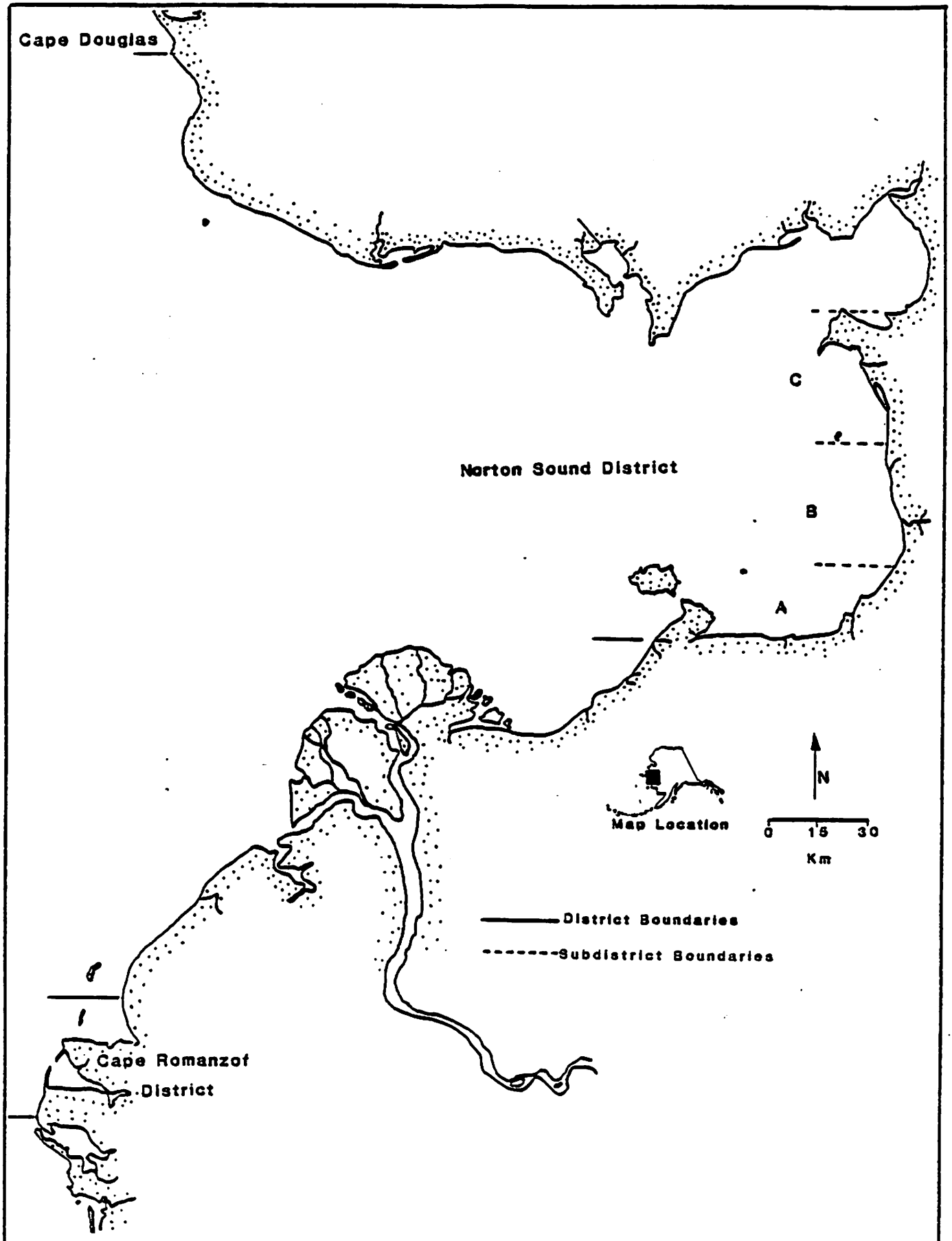

Figure 2. Cape Romanzof and Norton Sound (A=St. Michael, B=Unalakleet and C=Cape Denbigh Subdistricts) Commercial Herring Fishing Districts, Alaska

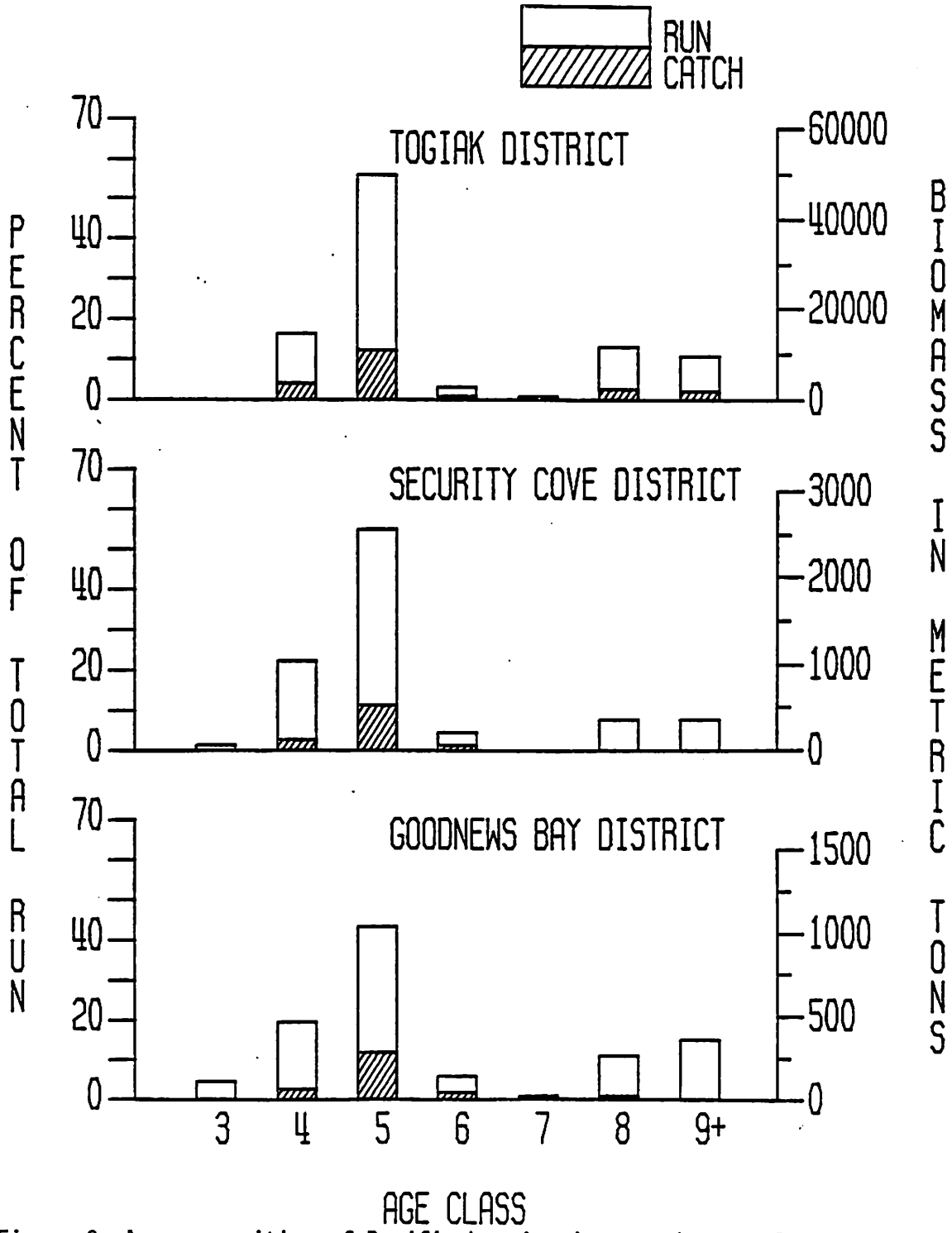

Figure 3. Age composition of Pacific herring in spawning populations and commercial harvests in Togiak, Security Cove and Goodnews Bay Commercial Herring Fishing Districts, Alaska 1982.

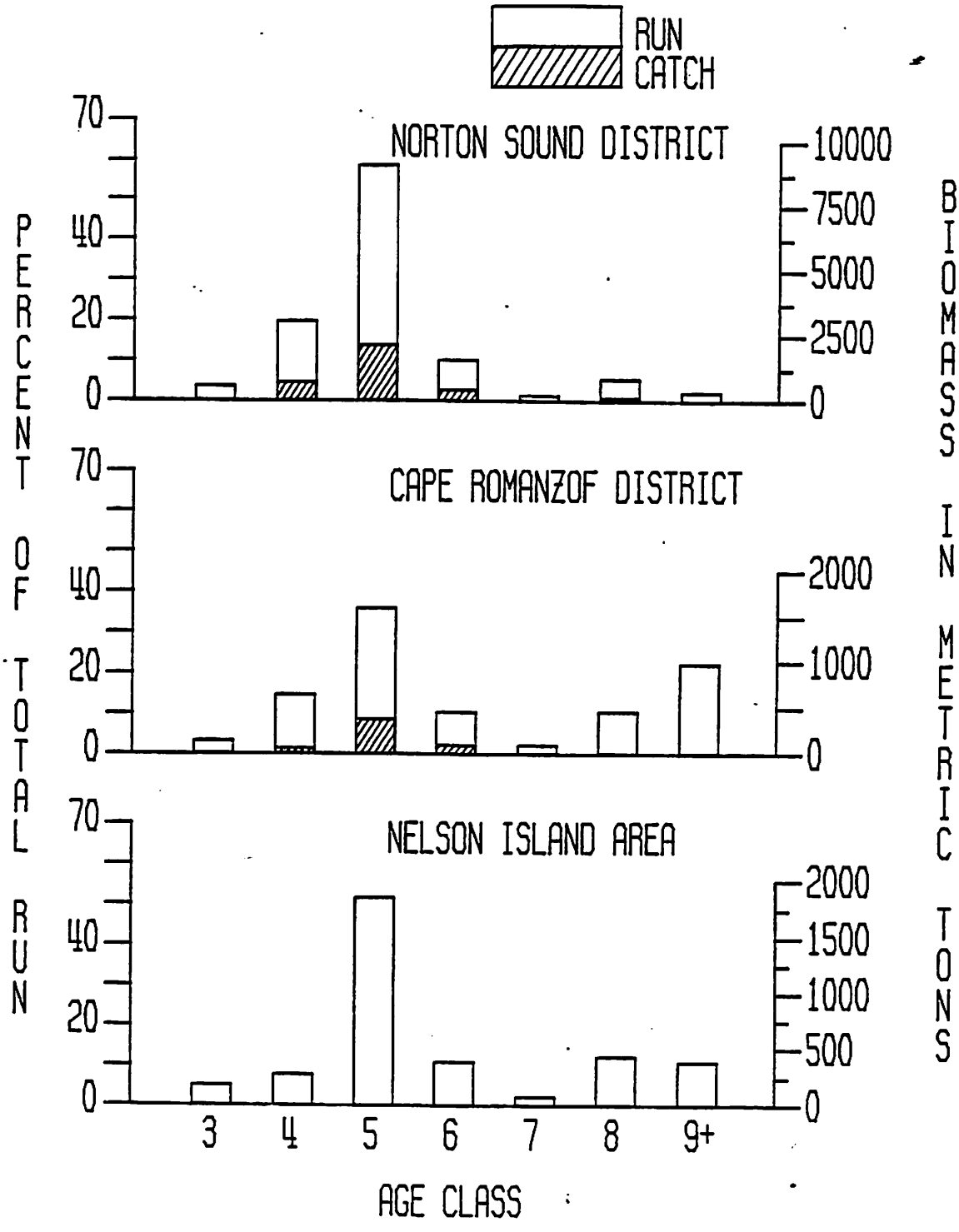

Figure 4. Age composition of Pacific herring in spawning populations and commercial harvests in Cape Romanzof and Norton Sound Commercial Herring Fishing Districts and the Nelson Island area, Alaska, 1982.

ALASKA DEPARTMENT OF FISH AND GAME

DIVISION OF COMMERCIAL FISHERIES

WESTWARD REGION

1982
HERRING FOOD/BAIT FISHERY REPORT
TO THE
ALASKA BOARD OF FISHERIES

DECEMBER 1982
ANCHORAGE, ALASKA

Submitted by: Larry Malloy
Regional Herring Biologist

1982

WESTWARD REGION HERRING FOOD/BAIT FISHERY

DESCRIPTION OF AREA

The Westward Region is composed of three finfish management areas (Figure 1). Namely (1) the Kodiak Management Area which comprises all Alaskan waters from Cape Douglas west to the southern entrance of Imuya Bay and includes the Kodiak - Afognak Island archipelago, (2) the Chignik Management Area which comprises all Alaskan waters from the southern entrance of Imuya Bay west to Kupreanof Point and includes adjacent islands, and (3) the Peninsula/Aleutians Management Area which includes all Alaskan waters west of Kupreanof Point on the southside of the Alaska Peninsula and west and south of the latitude of Cape Menshikof on the northside of the Alaska Peninsula to include all Alaskan waters of the Aleutian Islands.

HISTORICAL PERSPECTIVE

Herring food and bait fisheries have occurred throughout the region in varying production levels since the first recorded harvest in 1912 up to the present time. The "hayday" of this fishery occurred in the Kodiak area during a sustained seventeen year period, from 1934 through 1950, with an average annual harvest of 35,176 short tons (Table 1). Also within the region another smaller but sustained fishery occurred in the Aleutian Islands, centered near Dutch Harbor where an average annual harvest of 1,474 short tons was harvested over a ten year period from 1929 through 1938 (Table 2). In addition there were localized smaller fisheries which occurred in the Shumagin Islands and the Chignik area sporadically during the first half of this century, and more recently throughout the region as developing crab fisheries placed a premium on fresh bait.

The demise of the older larger fisheries resulted from changing market conditions and by 1959 all major food/bait operations in the region had ceased. Smaller localized operations continued to harvest herring for

personal bait use or commercial bait use; much of this harvest was never adequately documented but was suspected to be relatively small. 1/

REGIONAL MANAGEMENT STRATEGY

There are very few regulatory restrictions for the re-development of food/bait fisheries in this region. However, because sac roe fisheries have occurred continuously in portions of the Kodiak area since 1964 and portions of the Chignik and Alaska Peninsula areas since 1980 certain regulations do exist which protect these fisheries. Also current Board of Fisheries policies which provide for new fisheries development do so with concern for preventing double exploitation of identifiable herring stocks.

The prevailing management strategy recognizes the scope of historical, present, and future uses of this regions herring resources, defines exploited stocks abundance and distribution as well as possible, identifies industry effort and capacity and then provides for a reasonably flexible management approach which will hopefully protect the resource to sustain existing fisheries. This approach attempts to be flexible enough to meet changing industry requirements and to insure adequate biological monitoring of exploited stocks.

Kodiak Area

A published guideline harvest level of 1,000 tons exists along with a designated season extending from August 15 through February 28. Legal gear are seines, gillnets, and trawls, each with no size or aggregate limits. Thus a food/bait fishery is provided for; however, because the sac roe fishery has become so geographically extensive in this area the potential for

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1/ The NPMFC Bering Sea Herring Management Plan recognizes a potential harvestable biomass of 2,000 tons for any Aleutian Islands - Alaska Peninsula developing food/bait fisheries.

double exploitation could be high. There exists few geographically distinct areas which once were major food/bait production areas and which currently aren't part of the area exploited during the sac roe fishery; these few areas may yet yield virgin stocks for the re-development of a food/bait fishery. Also, those areas exploited during the sac roe fishery remain open during the food/bait season to provide for commercial exploration and ADF&G evaluation of any harvest which might occur.

Chignik Area

An identical management strategy exists for this area as for the Kodiak area except that seines are the only legal gear, and no guideline harvest levels exist.

Peninsula/Aleutians Area

A similar but slightly modified strategy prevails in this area. The sac roe fishery is historically minor compared to the food/bait fishery which after 40 years of relative inactivity is attempting to become re-established in the Eastern Aleutians and become both re-established and further developed in the South Peninsula area between Kupreanof Peninsula and Cape Sarichef.

No guideline harvest levels exist. In the Aleutian Islands the only closed period is from March 1 through April 15, while the remainder of the management area has a food/bait season extending from August 15 through February 28. Legal gear includes seines, gillnets and trawls, each without size or aggregate limits. The developing sac roe fishery has not proven to be as economically lucrative as the sac roe fisheries in adjacent management areas; consequently effort, landings and harvests have declined during the last two years. During the same period food/bait interest, effort and landing have been increasing. In an attempt to provide for both fisheries to a certain degree and to acquire more knowledge of the stocks within the area, both fisheries have been allowed to occur without geographical restrictions. By closely monitoring and collecting data from each fishery as it develops, double exploitation situations may be identified and remedied.

THE 1982 FISHERY

As of November 15, 4,146 tons of herring had been landed for food and bait purposes within the Westward Region, of which 2,455 tons were for food and 1,691 tons were for bait. Eight seine vessels and approximately 52 gillnet vessels made 106 and 57 landings respectively to seven processors throughout the region. The price for food herring varied from $100 to $300 per ton; bait herring was valued at $240 to $600 per ton. The bulk of both the food and bait herring was priced at $300 per ton; the maximum ex-vessel value of this fishery for the region was 1.24 million dollars.

Kodiak Area

This year as in recent years the Kodiak area's small bait catch came from a gillnet fishery occurring in several bays on the northend of Kodiak Island. A harvest in late summer of 12 tons from 5 landings was used for crab bait. However, this figure only represents a portion of the herring harvested for bait since there are approximately 50 small boat commercial halibut fishermen who participate in the gillnet sac roe fishery and who also gillnet their own fresh halibut bait in the spring just prior to the halibut season openings. That catch is estimated to be 4.0 tons, which when combined with that harvested for crab bait equals a total bait catch of 16 tons.

Registration prior to fishing has been required for the food/bait fishery since 1980 and there has been an increasing interest by all gear types. To date however, the actual effort and subsequent landings have been quite small.

The primary product sought has been fresh herring for local use as halibut and crab bait. No effort for food products has occurred since 1980 when a very small amount was salted and marketed unsuccessfully.

Chignik Area

No herring were landed for food and bait purposes from the Chignik area; there have been no recorded landings since Statehood. In the early and mid 1970's when there was an intensive shrimp fishery in this area occasionally incidental herring catches were made and subsequently frozen for personal crab bait, however no major bait fishery developed from these minor harvests.

Peninsula/Aleutians Area

South Peninsula Fishery:

Those South Peninsula districts extending from Kupreanof Point west to Cape Sarichef are the location of the regions newest food/bait fishery (Figure 2). The first landings were made in January and February of 1982 and since early October there have been 2 or 3 different vessels actively exploring throughout the area, so far without success. Aleutian Cold Storage at the Village of Sand Point has processed all of the herring harvested to date, however, at least five floating processors have expressed interest in processing Peninsula caught herring (Table 3).

The harvest to date has been 565 tons, all of which were taken in January and February 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 of exploratory fishing. This effort was hampered by unfamiliar grounds, unproven stock abundance, weather, an on-going crab fishery whose gear prevented extensive exploration, and miscellaneous crew/gear/tender and processor problems. Some of these same factors appear to be hampering the current fishing effort and add to the reduced efficiency of this commercial operation.

The ex-vessel value of this fishery was approximately $70,655; the first wholesale value is unknown at this time. Industry indications were that a food fish market existed which could have utilized the entire 565 tons harvested. Because of occasional quality problems, i.e. fish freshness

below food quality standards, approximately 190 tons were frozen for crab bait; the remaining 375 tons were frozen and packaged as food herring. The average value of each product was $240/ton for bait and approximately $160/ton for food.

The gear used in this fishery has been exclusively seine vessels using large herring purse seines 1400 to 1800 meshes deep and 200 to 250 fathoms long. Fishing occurs generally at night after the herring schools have risen high enough from the ocean bottom to be reached by these deep seines. The fish are located via a searching procedure where the vessel(s) run at relatively slow speed through areas where the ocean bottom contours are suspected of being good herring habitat. During the searching procedure sonar scans the water column ahead (or around if desired) of the vessel and suspected targets are "metered" by a recording echo-sounder which prints an image of the target showing its depth within the water column and its breadth at the point the boat passes over it. From this information a general idea of the number of schools, their masses and their catchability can be determined.

Because this is a new developing fishery without harvest guidelines and because it occurs on unknown stocks of unknown abundance in an area of close proximity to where sac roe harvest have occurred, very close ADF&G monitoring has been required. Every landing in January and February was sampled and the vessel operator interviewed as to precise fishing location, estimated stock abundance, areas explored, other species observed, herring behavior patterns, etc! In addition, a biologist spent time aboard the vessel during fishing operations to monitor the quantities and frequency of herring schools observed and to somewhat verify fisherman estimates of herring abundance. The more recent exploratory fishery this fall has been monitored from the ADF&G office at Sand Point which was manned with two extra seasonal biologists to aid in on the grounds monitoring of additional harvest activity which to date hasn't taken place.

The initial fishermen biomass estimates for the Stepovak Bay district were 2-3,000 tons. By late February an increasing number of schools in the district had increased that estimate to 5-6,000 tons. Again, no statistically

valid quantification of this biomass was possible, only the fishermens estimate, which was somewhat verified by an on-board observer. However, several unaffiliated crab fishermen who were knowledgeable about herring and who had briefly observed the herring operation indicated verbally that there were "good" quantities of herring showing on their own on-board electronics as they moved to and from the crab grounds. Consequently the season was allowed to remain open until the regulatory closure on February 28; additional considerations were that the exploitation rate was relatively slow as the on-going crab season dictated a herring processing capacity of 40 tons every 48 hours.

Aleutian Islands Fishery:

The Eastern Aleutians herring food/bait fishery is in its second consecutive year of successful re-development; the landings in 1981 were the first since 1945. A growing interest among local processors and fishermen, and a generally very favorable market response to the final food and bait products insure continued support for this fishery. The two ports of landing historically were and still are the communities of Dutch Harbor and Akutan (Figure 3).

In 1982 during the period August 5 through September 12 a total of 3,565 short tons of herring were harvested by seven limit-size seine vessels making 95 landings; no gillnet or trawl landings were made. The average price per ton was $300 which yielded a total ex-vessel value of 1.1 million dollars to the fishermen and tenders; estimated (unverified) first-wholesale value to the processors using an average of $800 per ton was 2.9 million dollars.

The seine gear used was from 200 - 250 fathoms in length and 1600 to 2200 meshes deep. The one unit of sunken gillnet gear fished was 300 fathoms in the aggregate; it only fished a short while. The three active trawlers used mid water trawl gear and were generally targeting on cod fish with the intent of landing herring if the opportunity presented itself; toward the end of September at least one trawler reportedly made an intense but unsuccessful effort to land herring for bait purposes. During the 38 day

period that landings occurred, approximately 30 days were fishable but landings occurred on only 24 of these days. The fishing technique by seiners was identical to that described for the South Peninsula food/bait fishery.

Of the six processors purchasing herring five were shore based plants and one was a floater which generally remained in Dutch Harbor; it did move to Makushin Bay for a short period. Two of these shore based processors also had floating processing vessels which could have been used. Five of the processors were located in Dutch Harbor and one in AKutan Bay. Of the 3,565 tons landed, unverified estimates indicate that approximately 2,080 tons were exported to Korean and Japanese food fish markets, 1,170 tons were utilized locally for crab bait, and approximately 180 tons were lost to spoilage.

As in 1981, the majority of the 1982 catch came from Unalaska Bay (Table 4). This facilitated maintaining herring of food quality as the travel time from the major fishing locations usually didn't exceed 2 to 3 hours. This was a critical aspect of this fishery since the herring were feeding heavily and "belly burn" could rapidly occur with improper handling. These herring were not "pounded" to clean their digestive tracts as was done during the historical fishery when salting was the primary method for processing food herring. Instead the seined-up herring were pumped aboard tanked fishing vessels or tenders and transported to either Dutch Harbor or Akutan processing facilities for prompt unloading and processing. Depending on how individual catches were handled in transport, i.e. how well the fish were chilled, the maximum time available to retain quality between fish being pumped from the ocean to being frozen was 6 to 8 hours during the most critical of conditions. Early in the fishery the water temperatures were warmer, the herring heavier with feed, and the herring more available to the fleet than towards the end. Consequently, during the fisheries start-up period relatively large volumes of "hot" herring could accumulate on vessels waiting to unload at processors where handling procedures for summer food herring were untried. As a result, approximately 180 tons of herring were wasted early in the season; however all of the herring landed after August 12 were processed, either for food,

as existing markets allowed, or for bait to be used in the local crab fisheries.

During the third week in August herring became less abundant in Unalaska Bay, the primary fishing location until then. The fleet explored westward and eastward resulting in additional harvests from northwestern coastal areas of Unalaska Island (Chelan Bank) and Makushin Bay. Akutan and Akun Island waters yielded nothing during this period. Unalaska Bay, although containing scattered fast moving schools of herring moving in and out of the bay, yielded only an occasional landing. Towards the end of August the herring disappeared from Makushin Bay and the inshore north coastal area. Concentrations of deep occurring herring seemed to become more abundant offshore on the outer Chelan Bank. At the same time occasional landings were still being made from Unalaska Bay. By the first week in September only one seine boat remained fishing. The lack of readily available herring and the increasing bad weather combined with the desire to finish up a long season which had begun on sac roe herring in April essentially finished the fishery. Since several of the processors were still buying herring, the one boat remaining continued to fish sporadically until the middle of September when reportedly the herring seemed to leave the area.

ADF&G ACTIVITY

ADF&G closely monitored this fishery with the resources available to it. Data collection was accomplished by ADF&G personnel working out of Dutch Harbor, Akutan Bay, and on the fishing grounds. Qualitative biological information was obtained through fishermen/processor interviews, on-the-grounds observations of fish finding and harvesting activities, and from observing processing activities. Quantitative biological data was obtained through daily commercial catch sampling. As a result, approximately 2,100 fish were collected in 42 samples of 50 fish each, over a 38 day period.

Data consisted of sex ratios; scales for aging, growth, and possible stock separation analysis; standard lengths and total body weights for growth and condition information; and gonad weight and condition.

The sex ratio data showed a slightly higher ratio of males to females, 51 and 49 percent respectively. The age composition data (Table 5) indicated that older fish were more abundant earlier in the season, that younger fish dominated the catches from approximately mid-August until the last landing occurred in mid-September, that herring associated with each of four geographical catch areas did not show significantly different age composition after the initial shift from older to younger fish occurred, and that the dominate age classes were 8 and 5 year old fish. Standard length-at-age comparisons (Table 6) indicated that the stocks were of the larger Bering Sea race of herring whose spawning range extends westward at least to Unalaska Island as evidenced by samples collected in known spawning areas in mid-April of 1972, and eastward in South Peninsula waters to Pavlof Bay. The total body weights averaged a heavy 320 grams per fish, partially as a result of being gorged with feed. Gonad development was surprisingly advanced, especially for the older age fish, particularly the males. Obviously a large part of the food value from their heavy feeding activity was being used in gonad development.

No biomass estimates within the catch area were made. From fishermen interviews, CPUE indicators, and on-the-grounds observations there appeared to be good quantities of herring available. The consensus was that because of herring feeding behavior patterns there was a continual migration within and possibly between geographical catch areas. It was felt that obtaining a realistic estimate of available biomass would require more knowledge of stock(s) distribution patterns. Consequently, because of the relatively small fleet and processing capacity a rather liberal management approach was taken and further justified by knowing that commercial effort would provide data required for determining stock(s) condition and possibly identification and abundance.

There was a prevailing concern that this fishery wasn't occurring on entirely virgin stocks, i.e. the stocks may have been at least in part

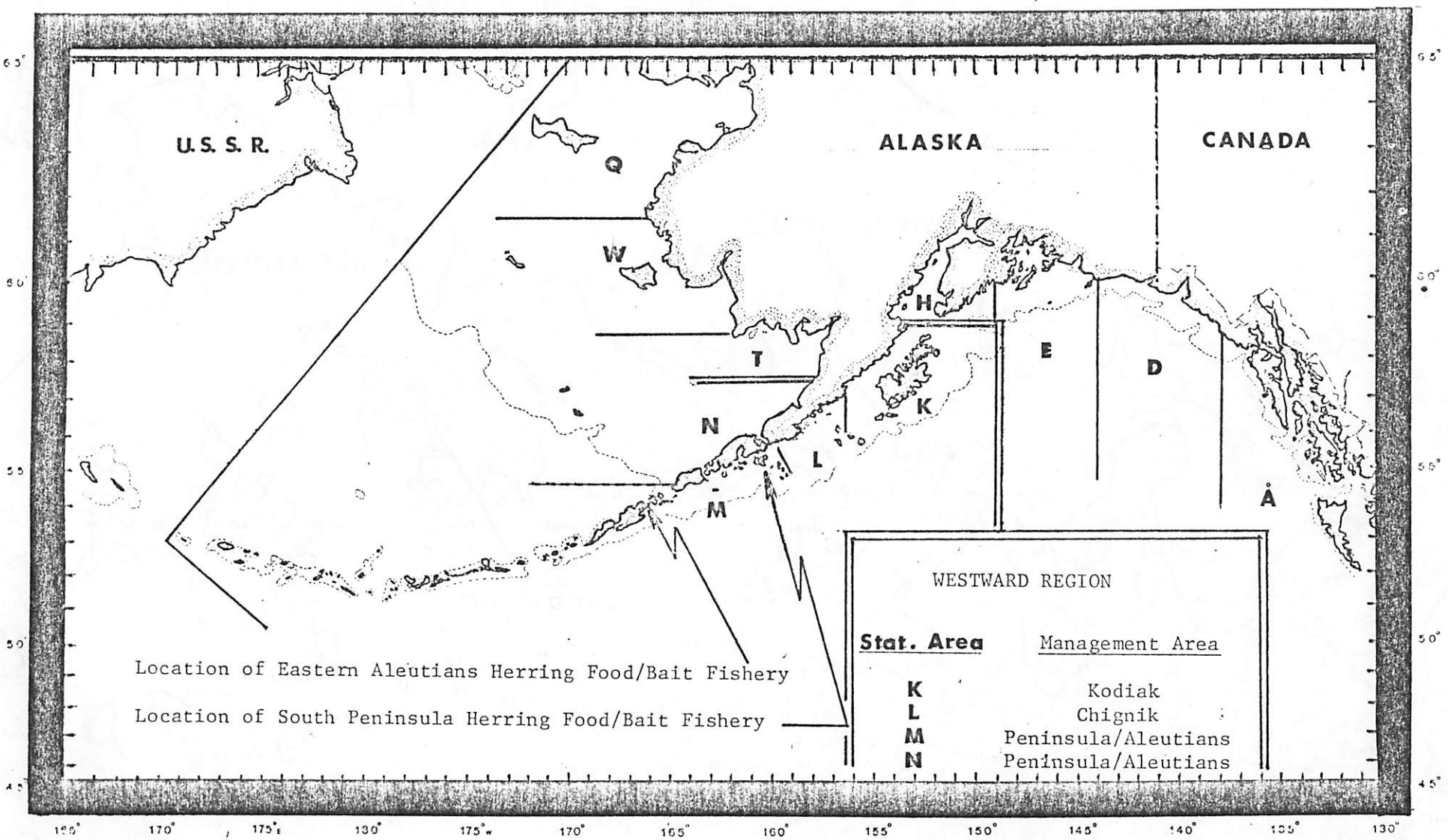
previously exploited in the coastal sac roe fisheries of western Alaska or the South Peninsula. The age composition and growth data was similar for these areas (Tables 5 and 6). However, information does exist indicating the presence of local spawning stocks, and these would be virgin stocks. Therefore the stocks being fished were, at best, a mixture of exploited and virgin stocks. Since commercial interest was very high and the fishery expected to grow annually at increasing levels of efficiency, the 1982 fishery was encouraged to continue beyond historic catch levels and locations as an exploratory data collection venture.

1983 MANAGEMENT PLAN

The 1983 management plan will be formulated around the Board of Fisheries final policy on herring resource management and on the newly established regulations resulting from the 1982/83 Board meeting. Special consideration will be given to newly established guideline harvest levels and designated exclusive fisheries (food/bait versus sac roe), and how they relate to pre-season age composition expectations, anticipated recruitment strength and biomass estimates. Consequently the management strategy should be less liberal than it has been during the developing phase of the food/bait fishery, and consequently more biologically sound.

FIG. 1

ALASKA HERRING STATISTICAL AREAS



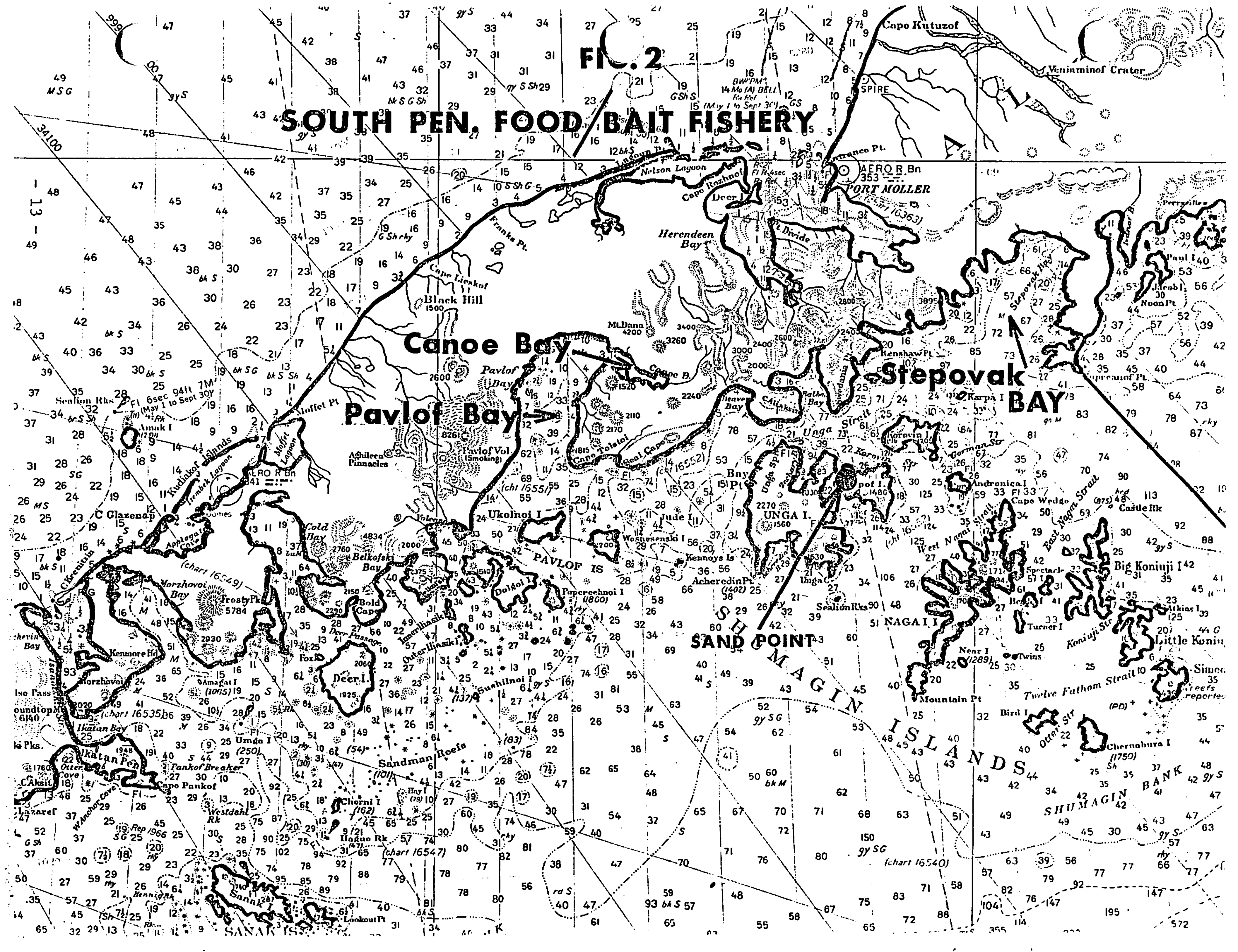


FIG. 2
SOUTH PEN. FOOD BAIT FISHERY
Canoe Bay
Pavlof Bay
Stepovak BAY
SAND POINT
PORT MOLLER
Herendeen Bay
Cold Bay
Belkofski Bay
Morzhovoi Bay
PAVLOF IS
UNGA I.
NAGAI I.
SHUMAGIN ISLANDS
SHUMAGIN BANK
Deer I.
Sandman Reefs
Sanak I.
Big Koniuji I
Little Koniuji
Chernabura I
Veniaminof Crater
Capo Kutuzof
Pavlof Vol. (Smoking)
Frosty Pk
Black Hill

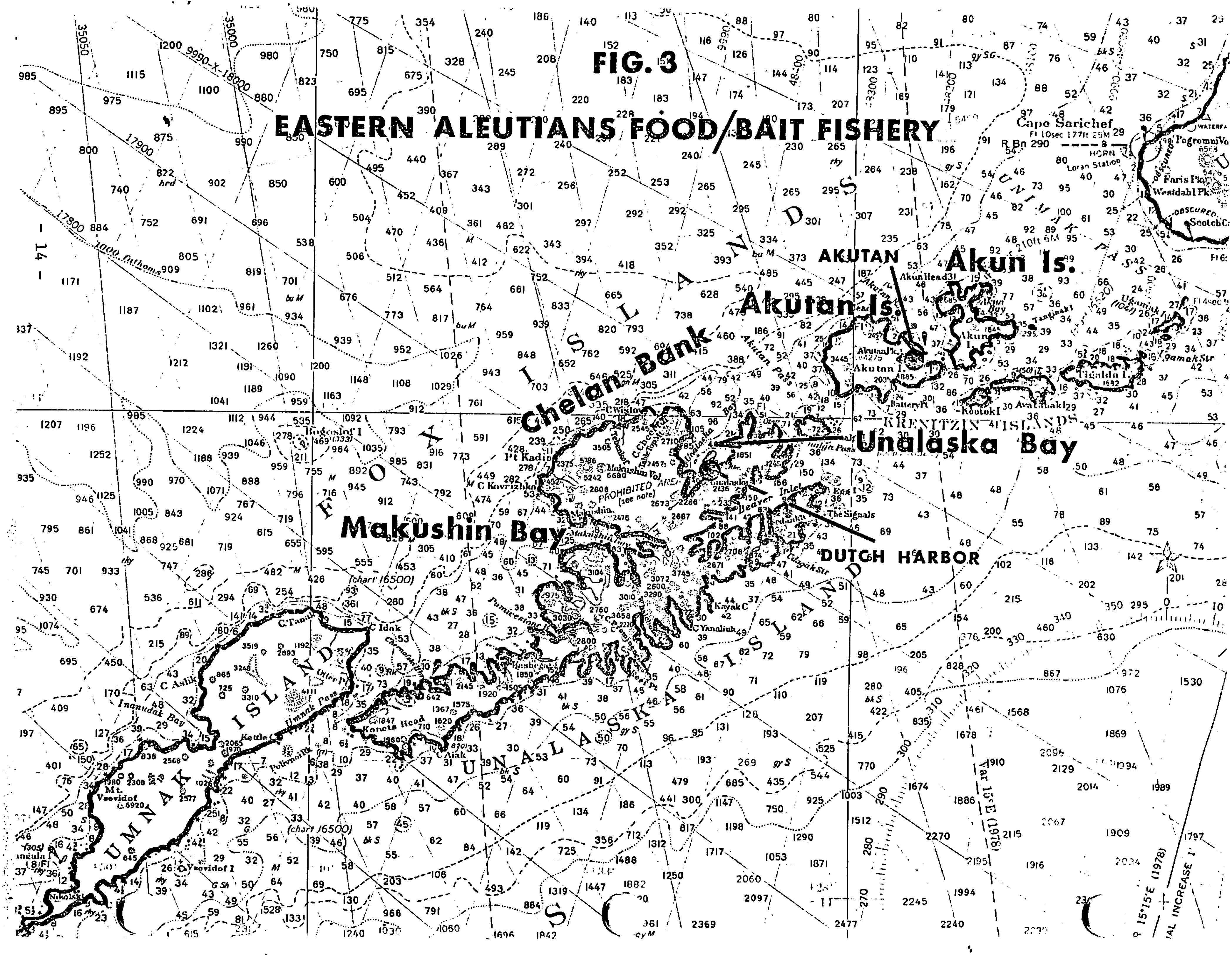

EASTERN ALEUTIANS FOOD/BAIT FISHERY
AKUTAN
Akun Is.
Akutan Is.
Chelan Bank
Unalaska Bay
Makushin Bay
DUTCH HARBOR
FOX ISLANDS
UMNAK ISLAND
UNALASKA ISLAND
UNIMAK PASS
KRENITZIN ISLANDS
Cape Sarichef
Akutan Pass
Beaver Inlet
Bogoslof I
Pt Kadin
C Kovrizhka
C Idak
Koneta Head
Mt. Vsevidof
Vsevidof I
Nikolski
Ugamak Str
Tigalda I
Avatanak I
Kayak C
Umnak Pass
Inanudak Bay
Scotch Cap
1000 fathoms
(chart 16500)

FIG. 3

TABLE 1

KODIAK AREA HERRING FOOD/BAIT HARVEST
1912 - 1982

YEAR	TONS HARVEST	YEAR	TONS HARVEST	YEAR	TONS HARVEST
1912	20.0	1937	27,659.3	1962	No Harvest
1913	No Harvest	1938	24,522.0	1963	" " "
1914	" " "	1939	38,600.5	1964	309.8
1915	" " "	1940	22,677.0	1965	35.0
1916	70.0	1941	40,083.5	1966	198.0
1917	137.9	1942	16,791.0	1967	300.3
1918	118.4	1943	35,352.0	1968	15.4
1919	259.7	1944	26,835.0	1969	Data Incomplete
1920	45.9	1945	31,114.0	1970	7.5
1921	944.9	1946	47,505.9	1971	44.2
1922	1,482.6	1947	50,743.0	1972	49.8
1923	321.5	1948	46,428.0	1973	178.0
1924	4,823.0	1949	No Harvest	1974	40.1
1925	9,997.0	1950	44,132.5	1975	5.2
1926	2,680.9	1951	4,299.0	1976	Data Incomplete
1927	2,592.9	1952	1,389.0	1977	Data Incomplete
1928	625.0	1953	725.0	1978	398.9
1929	No Data	1954	No Harvest	1979	124.8
1930	622.0	1955	" " "	1980	380.7
1931	1,000.0	1956	13,524.0	1981	18.0
1932	3,594.0	1957	21,818.5	1982	16.0
1933	2,312.5	1958	1,711.0		
1934	120,797.0	1959	3,831.0		
1935	No Data	1960	No Harvest		
1936	24,748.0	1961	" " "		

TABLE 2
ALEUTIAN ISLANDS HERRING FOOD/BAIT FISHERY
HISTORICAL CATCH/EFFORT LEVELS BY YEAR

Year	Harvest (Short Tons)	No. Processors	No. Boats	No. Lndgs.	$\bar{x}$ Tons Per Boat	$\bar{x}$ Tons Per Lndg.	$\bar{x}$ $ Per Ton	Ex-Vessel $ Value (Millions)
1929	1,259	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1930	1,916	"	"	"	"	"	"	"
1931 1/	1,056	12	26	"	"	"	"	"
1932 1/	2,510	12	30	"	"	"	"	"
1933 1/	1,585	12	38	"	"	"	"	"
1934	1,533	9	No Data	"	"	"	"	"
1935	2,412	10	"	"	"	"	"	"
1936	1,379	8	"	"	"	"	"	"
1937	579	No Data	"	"	"	"	"	"
1938	513	"	"	"	"	"	"	"
1939-44	No Fishery							
1945	75	No Data	"	"	"	"	"	"
1946-80	No Fishery							
1981 2/	704	2	2	16	352.0	44.0	300.00	.211
1982 2/	3,565	6	7	95	509.3	37.5	300.00	1.100

1/ All gear for 1931-1933 was gillnet gear except for 1931 when 1 seiners participated. Gillnet gear equals the number of gillnets fished; the records don't show how many gillnets were fished per individual, only the number owned per processor. The average length per gillnet for each year listed was: 1931-?, 1932-51.7 fathoms/net, 1933-46.7 fathoms/net.

2/ All gear for 1981 and 1982 was purse seine gear. Gillnet and trawl gear expressed interest and participated to a minimal degree without recording any commercial landings.

TABLE 3

WESTWARD REGION HERRING FOOD/BAIT FISHERY

PENINSULA/ALEUTIANS INDUSTRY EFFORT - 1982

S O U T H P E N I N S U L A

	Processors	Tenders	Seiners	Gillnetters	Trawlers
Expressed Interest	7	1	6	0	1
Participated (As of 11/15)	2 1/	0	3	0	0
Made Landings (As of 11/15)	-	-	1	0	0

1/ Two floating processors on grounds in late September and October.

A L E U T I A N I S L A N D S D I S T R I C T S

	Processors	Tenders	Seiners	Gillnetters	Trawlers
Expressed Interest	7	7	10	4	3
Participated (As of 11/15)	6	7	7	1	3
Made Landings (As of 11/15)	-	-	7	0	0

TABLE 4

WESTWARD REGION HERRING FOOD/BAIT FISHERY

ALEUTIAN ISLANDS HARVEST SUMMARY BY GEOGRAPHICAL AREA

Geographical Catch Area	Harvest in Short Tons		No. Landings		Average Tons/Lndg.	
	1981	1982	1981	1982	1981	1982
Akun/Akutan Islands	195	158	4	4	48.8	39.5
Unalaska Bay	509	1614	12	39	42.4	41.4
Chelan Bank	-	881	-	24	-	36.7
Makushin Bay	-	912	-	28	-	32.6
Total	704	3565	16	95	44.0	37.5

TABLE

ALEUTIAN ISLANDS HERRING FOOD/BAIT FISHERY - 1982
AGE COMPOSITIONS OF GEOGRAPHIC CATCH AREAS

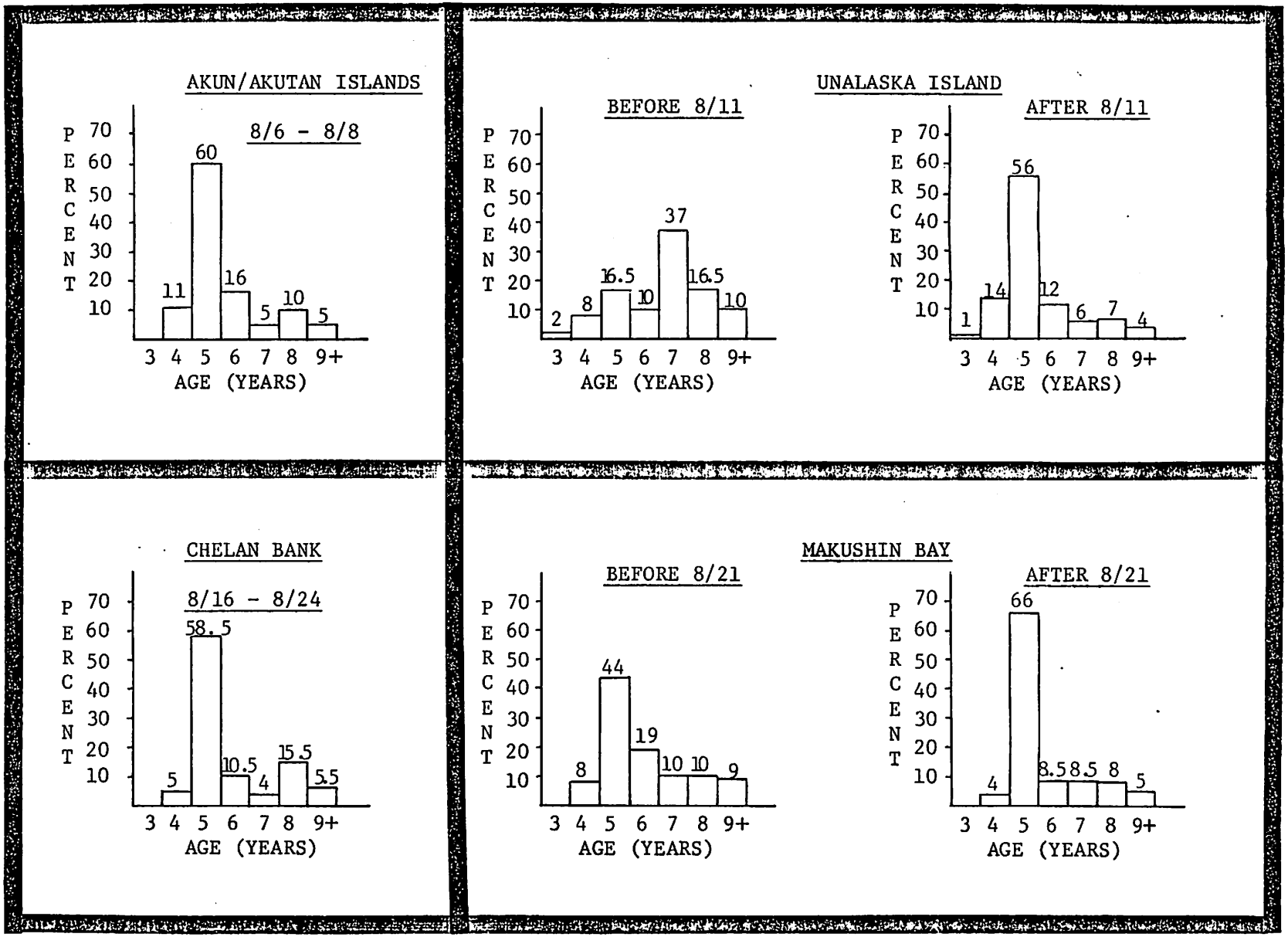
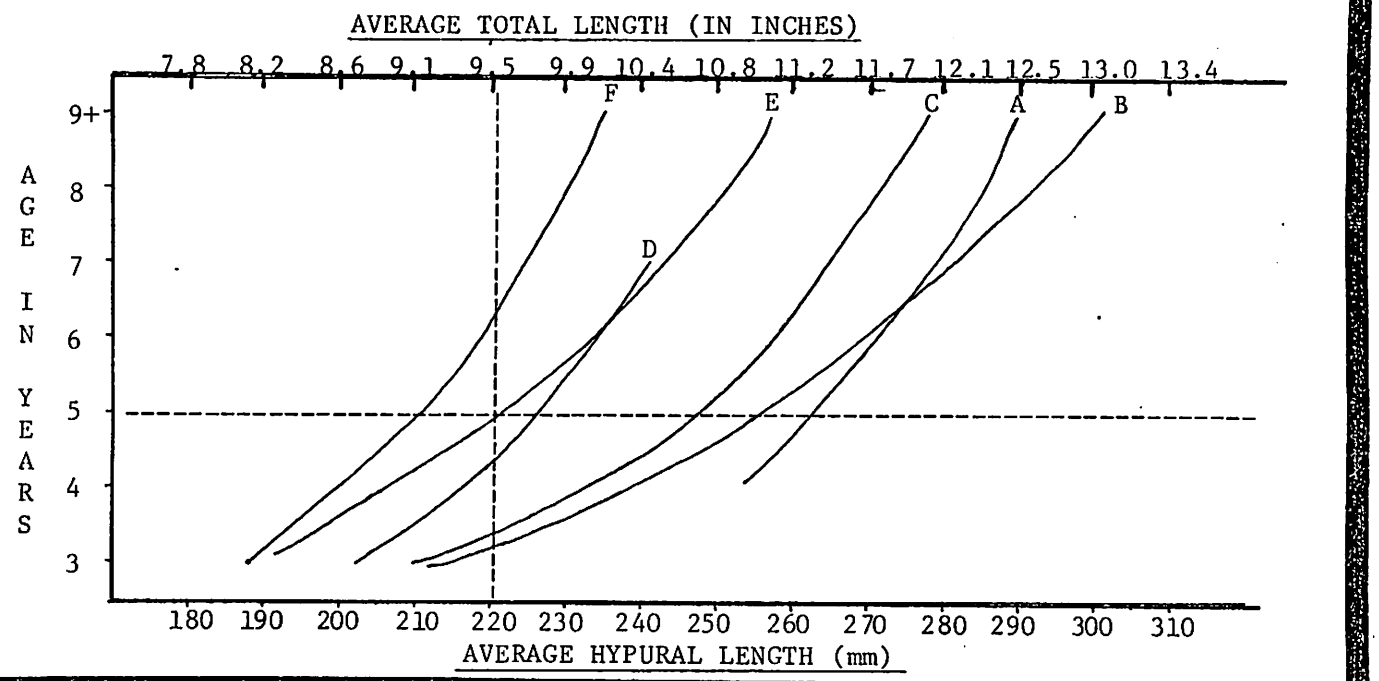


TABLE 6

ALEUTIAN ISLANDS HERRING FOOD/BAIT FISHERY - 1982

LENGTH AT AGE COMPARISONS WITH DATA FROM WESTWARD REGION SAC ROE FISHERIES



AVERAGE HYPURAL LENGTH (mm) BY AREA

Age	A Eastern Aleutians	B Port Moller	C Canoe Bay	D Stepovak Bay	E Amber Bay (Chignik)	F Olga Bay (Kodiak)
9+	289	301	278	-	257	235
8	287	292	268	-	255	229
7	279	275	265	241	248	223
6	269	266	257	231	234	217
5	262	260	252	226	227	218
4	254	242	233	217	202	186
3	-	212	210	202	192	188

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SCALE PATTERN ANALYSIS TO ESTIMATE THE ORIGIN OF HERRING IN THE DUTCH HARBOR FISHERY

by

R. V. Walker and K. N. Schnepf

Preliminary Report

to

Alaska Department of Fish and Game

December 1, 1982

ABSTRACT

Scale patterns and back calculated lengths were used to classify age 5 herring caught in the Dutch Harbor food and bait fishery to stock of origin. Five standards were used: Norton Sound, Cape Romanzof, Nelson Island, Togiak, and Port Moller. Norton Sound and Cape Romanzof fish were not detected in the Dutch Harbor samples. Overall classificatory accuracy was 73.4% for a three way analysis using Nelson Island, Togiak, and Port Moller stocks. Point estimates for the origin of all Dutch Harbor age 5 herring scales were 43.3% Togiak, 35.4% Nelson Island, and 21.3% Port Moller, with broadly overlapping 90% confidence intervals.

SCALE PATTERN ANALYSIS TO ESTIMATE THE ORIGIN OF HERRING IN THE DUTCH HARBOR FISHERY

This is a preliminary report on the use of scale pattern analysis to determine the stocks of origin of Pacific herring (Clupea harengus pallasi) caught in a food and bait fishery operating from Dutch Harbor (Unalaska Island), Alaska.

METHODS

Construction of Standards

Our analysis was limited to age 5 herring, the dominant age class in the 1982 roe and food and bait fisheries. Scales from eight spawning stocks were measured: Norton Sound, Cape Romanzof, Nelson Island, Goodnews Bay, Security Cove, Togiak, Port Moller, and Canoe Bay. The standard from Norton Sound was constructed of samples from three subdistricts (Klikitarik, Unalakleet, and Cape Denbigh) weighted according to biomass estimates provided by ADF&G biologists. A standard from the Togiak vicinity was constructed using samples from Goodnews Bay, Security Cove, and four Togiak subdistricts (Hagemeister, Kulukak, Togiak, and Nunavachak) weighted according to biomass estimates.

Desired standard samples (n=200) were available from all stocks except Nelson Island (n=186) and Canoe Bay (n=28). As there were so few age 5 scales from Canoe Bay, that stock was not included in the analysis. In addition, the age structure of the Canoe Bay stock was very different from that of the eastern Bering Sea stocks and from that of the Dutch Harbor catches. The dominant age classes at Canoe Bay were ages 6, 4 and 9, while the other groups were predominantly ages 5, 4, and 8.

After the initial five-class analysis, a composite standard of Norton Sound and Cape Romanzof scales was constructed, with the two stocks weighted by biomass estimates. This standard was used in the four-class analysis.

Sample Composition of Herring Unknowns

The Dutch Harbor food and bait fishery operated in four locations in the eastern Aleutian Islands: 1) in Unalaska Bay, 2) on Chelan Bank, and 3) in Makushin Bay (all three locations near Unalaska Island), and 4) near Akun and Akutan Islands. Scale samples were collected by ADF&G biologists from all of these areas throughout the fishing period. All age 5 scales collected from the fishery were measured and classified (n=584).

The unknown scales were also stratified by fishing date. Unalaska Bay scales were separated into two periods (8/10-16 and 8/22-27), as were Chelan Bank scales (8/18-19 and 8/24-27). A late sample from Unalaska Bay (9/9) was classified separately. Fish from the first two

days of fishing (8/5 and 8/9) appeared to have an age structure composed largely of older fish, but there were insufficient age 5 scales to classify these separately (n=10). However, these scales were included in the overall analysis. Combinations of area and time period were also analyzed.

Character Selection

In the initial five-class analysis, six characters were used: five backcalculated lengths (at ages 1 through 5) and one proportion (proportion of scale growth in first year, i.e., distance from focus to first annulus divided by total scale size). Backcalculated lengths were computed by a straight linear formula with no correction:

$$\text{Length at age } i = \frac{\text{distance to annulus } i}{\text{total scale size}} \times \text{length at capture.}$$

Classification accuracy in the five-class analysis was poor. One cause of this was concentration on backcalculated length characters. Length-at-age characters are all highly dependent on length at capture. While length at capture is a good discriminator between most of the stocks, the use of several dependent characters adds little additional power to the analysis. In addition, fish will classify to stocks largely on the basis of length (shorter fish to shorter stocks) and stocks having similar mean lengths will misclassify to each other (Norton Sound and Cape Romanzof; Togiak and Port Moller).

For the three- and four-way analyses, it was decided to examine characters dependent only on scale measurements, in addition to backcalculated lengths. Thirty characters were tested, of five basic types: 1) scale distances between annuli, 2) cumulative scale size at age, 3) proportion of scale growth in each year, 4) backcalculated lengths, and 5) combinations and ratios of distances between annuli. Four characters were selected, one from each of the first four categories: 1) scale distance between the second and third annuli (scale growth in the third year); 2) total size of scale at age 5; 3) proportion of scale growth in the second year; and 4) backcalculated length at age 5. Other characters were either dependent on those selected or were poor discriminators.

Classification and Point and Variance Estimation Procedures

Patterns of selected scale characters in the standards were used to classify scales of individual fish in the Dutch Harbor fishery samples to their probable stock of origin. Although the five-class analysis lacked sufficient accuracy to give acceptable point estimates, a trial run on the unknown samples indicated the Norton Sound and Cape Romanzof stocks were not present in the Dutch Harbor fishery area. The Norton Sound/Cape Romanzof combined stock was not detected in the four-class analysis (i.e., no positive point estimates were obtained). A final three-class analysis using the Nelson Island, Togiak, and Port Moller stocks was used in the classification of unknown samples presented in

this report. Point estimates and 90% confidence intervals were obtained for combinations of fishing location and time period where samples of 25 or more fish were available.

The term 'positive estimate' refers to any pont estimate greater than zero obtained for a stock in the classification of unknowns from one of the combinations described above. The term (statistically) 'significant estimate' refers to a point estimate whose 90% confidence interval does not include zero.

RESULTS

Classification of Standards

The results of classifying the various combinations of stock standards are shown in Table 1. Overall classificatory accuracy of the 5-class analysis was only 44.0%. The percentages of fish correctly classified as Norton Sound, Cape Romanzof, Nelson Island, Togiak, and Port Moller, were 50.5%, 45.0%, 30.1%, 47.5% and 51.0%, respectively. Nelson Island misclassified heavily with all stocks. Norton Sound and Cape Romanzof cross-classified with each other, as did Togiak and Port Moller.

In the 4-class analysis, overall accuracy jumped to 63.6%, with correct classification percentages of 62.5%, 49.5%, 73.0%, and 69.5% for Norton, Romanzof, Nelson Island, Togiak, and Port Moller, respectively. Nelson Island again had the lowest accuracy, and misclassified with all stocks.

The 3-class analysis yielded an accuracy of 73.4% overall, with accuracies of 65.6%, 76.0%, and 78.5% for Nelson Island, Togiak, and Port Moller. Highest misclassifications were with Nelson Island.

Classifications of Unknowns

Mixing proportion estimates and 90% confidence intervals were calculated for various combinations of fishing location and time periods (Table 2). Estimates for Norton Sound and Cape Romanzof stocks are not included, as no postive estimates were obtained for these stocks for any combination of location and period.

Positive estimates were obtained for the remaining three stocks (Nelson Island, Togiak, and Port Moller) for all combinations of location and period, except for Port Moller in Unalaska Bay on 9/9. These estimates were all statistically significant with the exception of one for Togiak (Akun/Akutan), two for Port Moller (Akun/Akutan; Chelan Bank during 8/18-19), and three for Nelson Island (Unalaska Bay during 8/22-27 and on 9/9; Chelan Bank during 8/24-27).

Although each stock exhibited a range of estimates, estimates for Togiak were generally above 40%, those for Nelson Island above 30%, and

those for Port Moller above 20%. This trend is reflected in the overall estimate for all unknown scales of 43.3% from Togiak, 35.4% from Nelson Island, and 21.3% from Port Moller.

DISCUSSION

Mixing proportion estimates of herring from Nelson Island, Togiak, and Port Moller showed a rough equivalence. Although confidence intervals were wide and broadly overlapping, the Togiak stock seems to rank highest in abundance, followed by Nelson Island and Port Moller. The lack of any positive estimates for Norton Sound and Cape Romanzof stocks indicate that these stocks are not present in detectable numbers in the Dutch Harbor fishery.

Estimates for Nelson Island seemed to decrease over time, while those for Togiak increased. This may indicate migrational movement through the area and a changing stock composition for the fishery. The estimates for Port Moller are relatively stable over time, showing no clear trend.

The classification accuracies of the standards and the mixing proportion estimates and confidence intervals of the unknowns are well within the range of estimations previously obtained in work on sockeye and coho salmon. If the stocks used for standards are the only stocks contributing to the Dutch Harbor fishery, then our results reflect the origins of the catch. However, if there are stocks from the Alaska Peninsula or the Aleutian Islands which contribute heavily to the fishery but have not been included in the standards, scales from those fish will be misclassified to one of the standards used.

There are several recommendations for future scale pattern work on eastern Bering Sea herring:

1) surveying, sampling and estimation of stock size of all spawning stocks on the Alaska Peninsula and in the eastern Aleutians, and collection of scales from all major spawning stocks;

2) additional scale collection from Nelson Island and Port Moller, to ensure adequate sample sizes and accommodation of analysis of other age classes; and

3) ensuring consistent scale collection techniques among all field crews.

Table 1. Decision arrays for 1982 age 5 herring of the Eastern Bering Sea for a) 5-class, b) 4-class, c) 3-class situations. The overall classificatory accuracies were calculated as the unweighted means of accuracies on the diagonals of the decision arrays.

a) 5-class:
Norton Sound vs. Cape Romanzof vs. Nelson Island vs. Togiak vs. Port Moller — Overall accuracy: 44.8%

Calculated decision	Correct decision (%)				
	Norton	Romanzof	Nelson	Togiak	Moller
Norton	101 (50.5)	48 (24.0)	41 (22.0)	2 (1.0)	8 (4.0)
Romanzof	53 (26.5)	90 (45.0)	31 (16.7)	5 (2.5)	16 (8.0)
Nelson	30 (15.0)	42 (21.0)	56 (30.1)	40 (20.0)	27 (13.5)
Togiak	8 (4.0)	11 (5.5)	37 (19.9)	95 (47.5)	47 (23.5)
Moller	8 (4.0)	9 (4.5)	21 (11.3)	58 (29.0)	102 (51.0)
Total	200	200	186	200	200

b) 4-class:
Norton Sound/Cape Romanzof vs. Nelson Island vs. Togiak vs. Port Moller — Overall accuracy: 63.6%

Calculated decision	Correct decision (%)			
	Norton	Nelson	Togiak	Moller
Norton	125 (62.5)	40 (21.5)	0 (0.0)	31 (15.5)
Nelson	49 (24.5)	92 (49.5)	33 (16.5)	20 (10.0)
Togiak	9 (4.5)	33 (17.7)	146 (73.0)	10 (5.0)
Moller	17 (8.5)	21 (11.3)	21 (10.5)	139 (69.5)
Total	200	186	200	200

c) 3-class:
Nelson Island vs. Togiak vs. Port Moller — Overall accuracy: 73.4%

Calculated decision	Correct decision (%)		
	Nelson	Togiak	Moller
Nelson	122 (65.6)	36 (18.0)	32 (16.0)
Togiak	35 (18.8)	152 (76.0)	11 (5.5)
Moller	29 (15.6)	12 (6.0)	157 (78.5)
Total	186	200	200

Table 2. Estimates of the mixing proportions of age 5 eastern Bering Sea herring in the Dutch Harbor food and bait fishery in 1982.

Fishing location	Fishing dates	Sample size	Mixing proportion estimates (%) within 90% confidence intervals: Nelson Island	Togiak	Port Moller
Akun/ Akutan	8/10-11	46	72.7(38.2-100)	6.2(0 -29.4)	21.1(0 -44.8)
Unalaska Bay	8/10-16	160	39.2(20.5-57.9)	39.8(24.5-55.0)	21.0(8.8-33.2)
	8/22-27	84	13.0(0 -35.5)	67.4(46.6-88.2)	19.6(4.7-34.4)
	8/10-27	244	30.2(14.7-45.7)	49.3(36.1-62.4)	20.5(10.6-30.4)
	9/9	32	7.8(0 -42.4)	92.2(60.8-100)	0
	8/5-9/9	286	26.2(11.8-40.7)	53.2(40.7-65.7)	20.6(11.4-29.7)
Chelan Bank	8/18-19	71	39.4(12.5-66.4)	52.7(29.6-75.7)	7.9(0 -22.7)
	8/24-27	76	22.0(0 -45.8)	36.6(16.9-56.2)	41.1(22.6-60.2)
	8/18-27	147	30.4(11.7-49.1)	44.3(28.6-60.1)	25.2(12.5-38.0)
Makushin Bay	8/20-22	105	51.9(27.8-74.1)	31.2(13.0-49.4)	17.8(3.0-32.6)
Unalaska/ Akun/ Chelan-pooled	8/10-19	250	46.8(30.4-63.2)	39.5(26.3-52.8)	13.7(3.9-23.5)
Unalaska/ Chelan/ Makushin-pooled	8/20-27	265	30.6(15.8-45.5)	44.2(31.8-56.6)	25.2(15.2-35.1)
All locations	8/10-27	542	37.9(25.7-50.1)	40.8(30.9-50.6)	21.3(13.7-29.0)
	8/5-9/9	584	35.4(23.6-47.2)	43.3(33.6-53.0)	21.3(13.9-28.7)

Summary of Public Hearing on
Herring FMP in Bethel, Alaska

November 10, 1982

The North Pacific Fishery Management Council held a public hearing on revisions to the Herring FMP in Bethel, Alaska on November 10, 1982. The Council was represented by Rudy Petersen, Leroy Sowl and Clarence Pautzke. The following people attended:

Moses Ayagalria	Napakiak, AK 99634
Paul Kiunya	Kipnuk, AK 99614
John I. Nicori, Sr.	Kwethluk, AK 99621
Raymond C. Christiansen	Bethel Calista Corp.
Axel C. Johnson	Emmonak, AK 99581 Task Force Member
Harry Wilde, Sr.	Mt. Village, AK 99632
Issac Hawk	Eek, AK 99578
Ralph Horn	Bethel, AK 99559
Frank Demantle, Sr.	Kuskokwim United Fishermen Assn.
Ron Southern	Bethel, AK 99559
Mark John	United Village of Nelson Island
Paul John	United Village of Nelson Island
Jack Williams	Mekoryuk, AK 99630
Norman Cohen	Nunam Kitlutsisti
Stella Davey	Alaska Native Foundation Fisheries Program
Nels Alexie	Kuskokwim Community College P.O. Box 368 Bethel, AK 99559
George Hert	YKHC, Bethel, AK 99559
Mike Williams	AVCP Fisheries Task Force
DeeDee Jonrowe	ADF&G, Bethel, AK 99559
Tony Vaska	State Representative
John R. Stone	Chevak, AK 99563
John Paul Jones	Nunam Kitlutsisti
Jesse Foster	Quinhagak, AK 99655

The following comments were received at the hearing:

Paul Kiunya, Sr.: Herring populations are low at Kipnuk and he strongly opposes an offshore fishery which might recreate problems associated with the Japanese fishery of the past. He is a subsistence user and does not want the stocks intercepted offshore. Commercial uses of herring are becoming important too.

Ralph Horn: Everybody opposes offshore fishing on mixed stocks.

Harry Wilde, Sr.: Against offshore fishery because it would intercept herring used locally. Chevak, Hooper Bay, and Seammon Bay derive cash income from the commercial herring fishery. These inshore fisheries must not be hurt.

Axel Johnson: Subsistence is a way of life for natives. Subsistence is their main source of food and must be protected.

Jesse Foster: Biological information is lacking on the impacts of an offshore fishery and management is more political than biological. Must keep harvest inshore. Does not support a high seas fishery. Made point that all age classes are used in the estimation of biomass but 1-3 year olds are too small to catch in gillnets. This could result in perceived underharvest.

John Stone: He asked how an offshore fishery would benefit the inshore fishery. He was concerned about the Board of Fisheries guidelines at Cape Romanzof.

Paul John: Subsistence is important to native village uses. Fish stocks were low at one point and only small herring came back. Nelson Island people use herring as food and are not in favor of offshore interceptions. Herring resource is as important to Nelson Islanders as having a steady job.

John Paul Jones: FMP revision was not delivered in time for adequate review. Natives need cash base to buy equipment, fuel and clothing and are just getting into the commercial herring fishery. He fears that an offshore allocation will hurt this developing source of much needed cash.

Ray Christiansen: He questioned the conditions under which the Regional Director and ADF&G could open an offshore fishery north of 55°47'N before July 1 in Section 2.5.2.

Norman Cohen: The local concern is to protect the northern stocks. FMP revision moves in the right direction but does not go far enough. There is no recognition that fish not caught one year will come back to spawn another year and therefore are not surplus. He is still strongly opposed to any offshore fishery as long as it is necessary to limit the inshore fishery.

The Association of Village Council Presidents passed a resolution calling on the North Pacific Council to reject those portions of the FMP which authorize a high seas trawl fishery for herring (see attachment).

ASSOCIATION OF VILLAGE COUNCIL PRESIDENTS
FISHERIES TASK FORCE

REQUESTING THE NORTH PACIFIC FISHERY MANAGEMENT COUNCIL NOT TO ACCEPT PORTIONS OF THE BERING/CHUKCHI SEA HERRING PLAN WHICH PROVIDES FOR AN OFFSHORE, HIGH SEAS TRAWL HERRING FISHERY

WHEREAS, the Association of Village Council Presidents Fisheries Task Force is made up of representatives of the fishing industry from throughout the Yukon-Kuskokwim Delta; and

WHEREAS, the North Pacific Fisheries Management Council is presently considering a Bering/Chukchi Sea Herring Management Plan which includes provisions for an offshore, high seas, trawl herring fishery on mixed stocks of herring which winter in the eastern Bering Sea; and

WHEREAS, there are coastal villages of the Yukon-Kuskokwim Delta which rely upon the herring stocks of the eastern Bering Sea for their nutritional needs, especially in the villages of Nelson Island and vicinity; and

WHEREAS, the herring resource is becoming an important source of income for some coastal villages because of the new commercial herring fisheries in the Cape Romanzof and Cape Newenham areas; and

WHEREAS, when high seas herring fishing was conducted in the early 1970's, primarily by the Japanese and Russian fishing vessels, there was an extreme reduction in the amount of herring which spawned along the Yukon-Kuskokwim delta; and

WHEREAS, this reduction caused a hardship on those villages which rely upon the herring for food; and

WHEREAS, fishing on mixed stocks of herring can be very dangerous to the continued health of the resource, especially to the smaller herring stocks which spawn north of Cape Newenham, but which commingle with the larger Bristol Bay stock on the high seas during the winter months; and

WHEREAS, herring which are not harvested in the inshore subsistence and commercial fisheries will return again to the spawning grounds in later years and will again be available for harvest there.

NOW THEREFORE BE IT RESOLVED that the ASSOCIATION OF VILLAGE COUNCIL PRESIDENTS FISHERIES TASK FORCE requests that the North Pacific Fishery Management Council reject those portions of the Bering Chukchi Sea Herring Management Plan which authorize a high seas, trawl herring fishery.

Dated: November 11, 1982

Vice - Chairman

Secretary

D-2 Supplemental
December 1982

Marine Resources Company

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December 2, 1982

Jim Branson, Executive Director
North Pacific Fisheries Management Council
Post Office Box 3136 DT
Anchorage, Alaska 99510

Dear Jim,

Enclosed is our proposed adjustment to the latest revisions Chuckchi Sea Herring being considered for the Bering Sea/~~Aleutian Island~~ FMP. We understand the Coucil in meetings together with the Board of Fisheries have on their agenda a discussion of these recent revisions and we would like our proposed adjustment to be included. You will find it similar yet not identical to a proposal we made at the July council meeting. I will personally be giving public testimony on the current revision package being considered and this proposal will comprise a portion of my presentation. Additional written testimony will be presented at the time of public testimony but we wanted this portion to be available for any distribution you felt advisable.

Best regards,

Mick Stevens
Manager
Operations Department

MS/kr
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PROPOSED ADJUSTMENT OF BERING/CHUKCHI SEA FMP

PURPOSE: To resolve the present conflicts about procedures for allowing or not allowing an offshore domestic fishery for herring. This Proposal is a compromise approach intended to balance the interests and concerns of the parties on both sides of this question. This amendment if accepted may also substantially reduce the likelihood that the plan will be contested in court of law by one or both of the parties.

TEXT: In the first three years following the implementation of this FMP an offshore domestic fishery at the minimum level of 10,000 tons will be authorized on an experimental basis. The fishery will be authorized for the period October through April and shall be conducted north of 56° 00' N Latitude in the Bering Sea. If on a year by year basis the inshore fishery significantly underharvests the resource then the Secretary/Council/Regional Director may increase the allocation to the domestic offshore fishery up to a maximum limit of 50% of the relevant final OY. At the end of this three period the impact and benefits of this experimental offshore fishery will be evaluated to determine the future of such an allocation approach.

RATIONALIZATION:

1) Proposal suggest a rather moderate level for the offshore fishery. Some minimum quantity must be assured to give the catching and processing industry an opportunity to gain experience with the species as a food fish: where and how to catch it, what the concentrations are like, how to handle and process it together with the very important task of exploring and developing diverse markets. With the many conservative factors already incorporated into the plan for determining biomass estimates, setting exploitation rates and other management measures this level of allocation seems quite defensible from a biological point of view.

PROPOSED ADJUSTMENT OF BERING/CHUKCHI SEA FMP

(continued)

RATIONALIZATION:

2) The allocation is not permanent. After three years it may be eliminated or modified if necessary.

3) If evidence exists or can be generated thru monitoring of the limited offshore fishery, while it is in process, that there exists discrete spawning stocks mixing in offshore areas which are significantly and adversely impacted by the offshore fishery then the Council/Regional Director/ Secretary may have in season control and make changes.

4) The domestic trawler fleet is in dire need of any and all kinds of markets, particularly as a result of the very poor prospects over the next few years for sustaining income from the crab fisheries.

5) The council has established a precedent for allowing a "domestic fishery on an experimental basis" in an area of domestic concern over species composition. The Bering Sea/Aleutian Island FMP provides for domestic trawling "on an experimental basis" within the pot sanctuary.

6) Given the lack of significant risk in conducting an offshore fishery at moderate levels the ultimate justification for this experimental fishery is the opportunity to generate useful data. Nobody can argue that many of the most difficult problems associated with finalizing this plan result from lack of data. An offshore fishery offers the very best opportunity to generate some of this needed data. Fishery managers must of course base their decisions on the best data available. Responsible management however should seek out and encourage the generation of this data so that the largest possible base of objective information is available for consideration.

2 December 1982

Information on Bering Sea herring from 1982 Northwest and Alaska Fishery Center Resource Survey Cruises September-October, 1982

by
Vidar G. Wespestad and Jeffery June
Northwest and Alaska Fisheries Center
National Marine Fisheries Service

The Northwest and Alaska Fisheries Center (NWAFC) has tested the feasibility of assessing herring in the eastern Bering Sea. Past attempts have focused on hydroacoustic surveys over the winter grounds northwest of the Pribilof Islands. However, past surveys have been unsuccessful due to the difficulty of operating in the Bering Sea during winter months in the vast area to be covered with limited vessel time. The NWAFC conducts annual crab and groundfish assessments in the eastern Bering Sea during the summer months but few herring are taken in these surveys. It is believed that herring are in coastal waters during the time of the surveys.

In autumn 1982 two special study cruises were conducted along the outer continental shelf in which larger than usual quantities of herring were caught. This paper reports the herring data obtained in these cruises.

The first cruise examined differences in species composition on either side of a temperature front occurring on the outer continental shelf. Larger catches of herring were made on the warm side of the front(table 1). The average CPUE for herring on the warm side of the front was 38.66 kg/ha or 65.72 kg/km. The survey was concentrated in too small an area to derive a biomass estimate from these catches. All trawling was done with a two seam otter trawl 17 m wide by 2.5 m high during daylight hours. Herring appeared to have been on bottom as little sign was observed in the water column and herring in the catch were well mixed throughout the codend.

The second cruise was designed to investigated marine mammal food habits relative to available fish species. Marine mammal observations and sampling occurred during the day and trawling was conducted at night. Trawling was accomplished using a eastern bottom trawl similar to the one fished on the on the first cruise. A total of 50 hauls of 30 min duration were made along the outer continental shelf between Unimak Pass and the Pribilof Islands (figure 1).

Herring occurred in 34 of the 50 hauls completed during the second cruise. In many hauls herring was a significant portion of the haul with catches over 200 lbs in several hauls. The average CPUE of herring in all hauls was 4.3 kg/km. This CPUE value is appropriate if all the herring in the trawl were taken while the trawl was on bottom. However, onboard observations indicated that most herring were at the head of the codend indicating that they were caught towards the end of the haul either on bottom or in the water column during the haul-back. Indications are that the herring were caught in the water column during haul-back. All hauls were made at night during which herring are dispersed in the upper water column actively feeding. These factors suggest that herring were caught while the net was off-bottom therefore effort was adjusted to 10% of total fishing time,the estimated effective portion of total effort. The adjusted CPUE estimate was 43.1 kg/km. Applying the adjusted average CPUE over the survey area (66,756 sq.km) produced an estimated mean biomass of 168,698t.(s.d.=71,367t.). The distribution of catches is shown in figure 2.

The herring taken in the survey were generally large (figure 3). The mean length was 28.6 cm (fork length) with a mode at 28-29 cm. Adjusting fork length to standard length 28-29 cm herring will be age 7-8 next spring assuming growth was nearly complete at the time of the survey.

Table 1. Comparison of herring catch rates on either side of the eastern Bering Sea shelf "cold front" recorded on the R/V Chapman in September, 1982

Warm side						Cold side					
haul no.	sample wt.	sample no.	mean wt.	temp C.	CPUE kg/ha	haul no.	sample wt.	sample no.	mean wt.	temp C.	CPUE kg/ha
2	35.0	191	0.183	4.6	8.05	1	0.0			2.9	
3	1.1	6	0.189	4.7	0.53	12	14.1	60	0.234	3.0	6.16
4	25.4	116	0.219	4.7	11.93	13	1.8	12	0.151	3.0	0.83
16	2.4	7	0.343	4.8	1.03	14	5.0	33	0.151	3.1	2.22
17	0.9	3	0.302	4.7	0.40	15	1.8	12	0.151	3.1	0.78
18	0.0			4.8		22	9.1	65	0.139	2.8	4.14
19	31.9	105	0.304	4.8	14.17	23	8.6	64	0.134	2.7	3.58
20	6.3	17	0.368	4.8	2.77	24	22.0	147	0.149	2.8	9.63
21	245.8	961	0.255	4.9	112.17	25	35.6	231	0.264	3.0	14.79
29	117.8	949	0.187	4.8	78.92	26	15.9	107	0.148	2.8	6.89
30	508.5	2121	0.239	4.7	213.98	27	5.9	38	0.155	2.8	2.58
31	46.3	221	0.209	4.6	19.99	28	5.7	41	0.139	2.8	2.41
mean kg/ha					38.66						4.50
sd. dev.					65.70						4.29
mean kg/km					65.72						7.63

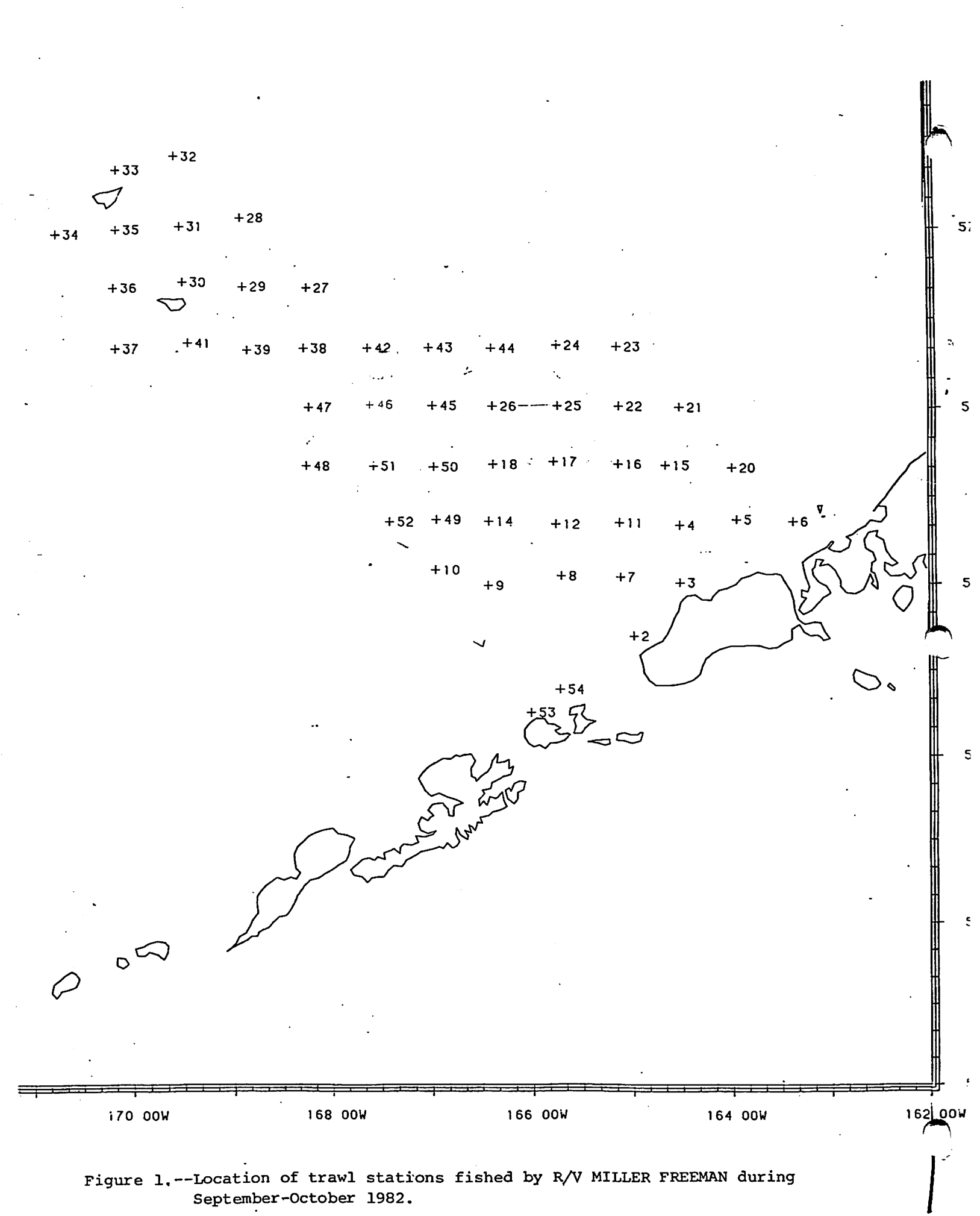


Figure 1.--Location of trawl stations fished by R/V MILLER FREEMAN during September-October 1982.

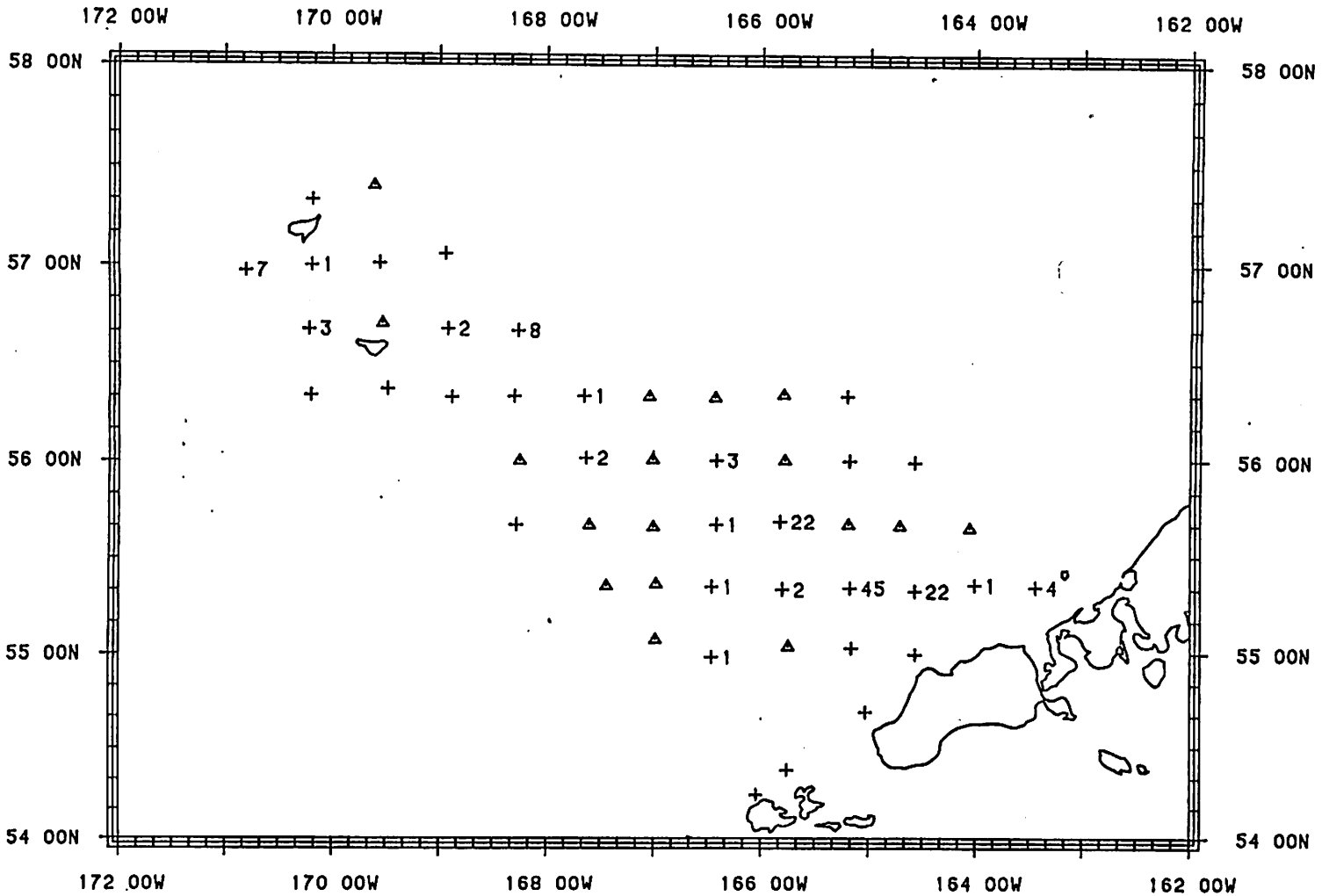
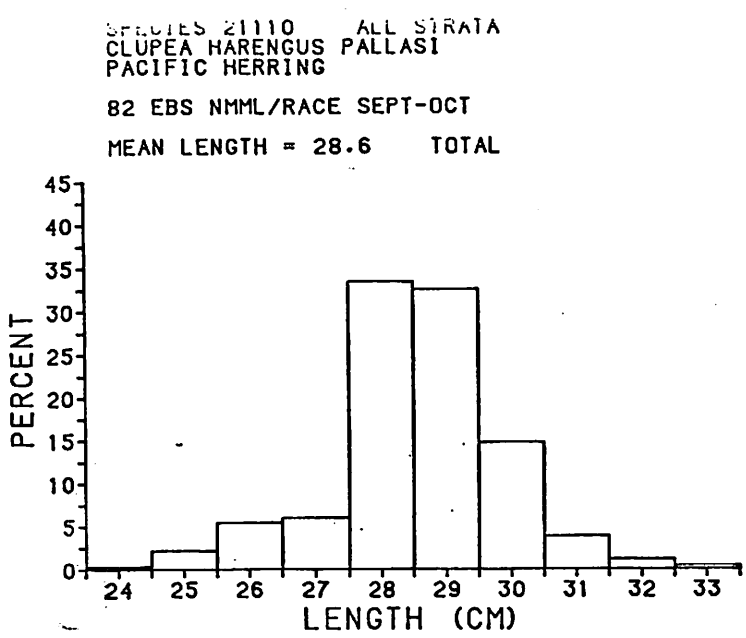


Figure 2.--Survey catch per unit effort (CPUE) of Pacific herring in kg/km. Triangle = less than 1 kg/km, plus = no herring caught at station.



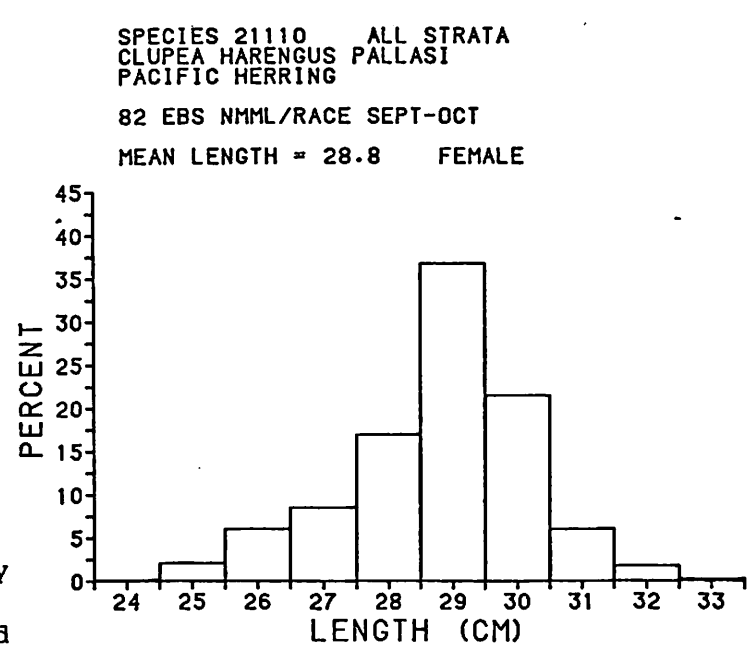
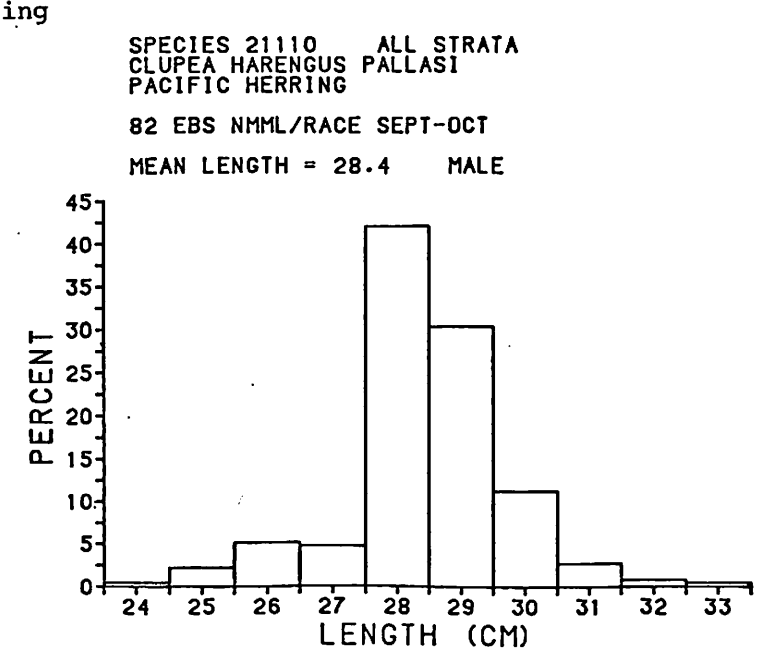


Figure 3.--Length frequency of Pacific herring captured during September-October 1982 in the eastern Bering Sea by the R/V MILLER FREEMAN.



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December 2, 1982

Jim Branson, Executive Director
North Pacific Fisheries Management Council
Post Office Box 3136 DT
Anchorage, Alaska 99510

Dear Jim,

Enclosed is our proposed adjustment to the latest revisions being considered for the Bering Sea/Aleutian Island FMP. Chuckchi Sea Herring
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Best regards,

Mick Stevens
Manager
Operations Department

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PROPOSED ADJUSTMENT OF BERING/CHUKCHI SEA FMP

PURPOSE: To resolve the present conflicts about procedures for allowing or not allowing an offshore domestic fishery for herring. This Proposal is a compromise approach intended to balance the interests and concerns of the parties on both sides of this question. This amendment if accepted may also substantially reduce the likelihood that the plan will be contested in court of law by one or both of the parties.

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PROPOSED ADJUSTMENT OF BERING/CHUKCHI SEA FMP

(continued)

RATIONALIZATION:

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2 December 1982

GARVEY, SCHUBERT, ADAMS & BARER

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December 1, 1982

Mr. Jim H. Branson
Executive Director
North Pacific Fishery Management
Council
P.O. Box 313
Anchorage, AK 99510

Re: Proposed Herring FMP

Dear Jim:

As attorneys for the Japanese Deep Sea Trawlers Association and the Hokuten Trawlers Association, we are submitting the following comments on the proposed revisions of the Herring FMP for your review:

I. Allowable Incidental Catch (AIC).

Although it is implied that foreign fishermen may retain herring that are incidentally caught while harvesting groundfish up to each nation's AIC limit, this is nowhere expressly stated in the FMP. This oversight should be corrected by modifying § 13.0 to include the following:

> "Although the TALFF for herring is equal to zero, herring may be retained by a foreign nation's fishing vessels up to the limits of that nation's AIC allocation."

Section 13.0 originally contained the following language:

> "This AIC is thus part of the groundfish OY and may be retained."

The newly proposed Section 13.0 was completely rewritten and omits any mention of AIC retention. We believe that such retention is intended by the Council and therefore language to this effect should be included in the FMP.

II. Herring Savings Closure.

Sections 14.3.2(iii) and 14.4.1(ii) should be revised to clarify that the herring savings area will be closed on a nation-by-

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nation basis; i.e., that a nation's fishing operations in the herring savings area will be terminated only when that nation's incidental herring catch reaches the specified level. We suggest that §§14.3.2(iii) (relating to the domestic fisheries) and 14.4.1 (relating to the foreign fisheries) be revised as follows:

> "All or part of the herring savings area . . . will be closed to domestic herring and groundfish trawl fisheries by the Regional Director, if:
>
> "A. DAH and the domestic AIC have been harvested;
>
> "B. The amount of remaining Domestic Annual Harvest (DAH) and domestic AIC can be harvested within one reporting period (one week)."

FMP §14.3.2(iii).

> "All or part of the herring savings area, . . . will be closed to a nation's herring and groundfish trawl fisheries by the Regional Director, in consultation with the council, if:
>
> (a) There is no remaining AIC for that nation; or
>
> (b) The amount of remaining AIC for that nation can be harvested within one reporting period (one week)."

FMP §14.4.1(ii).

III. Regional Director's Discretion to Exempt Certain Gear Types.

Gear types which do not catch herring above trace amounts are exempt from the herring savings closure. If trawl gear is developed which has a similarly insignificant impact on herring, the Regional Director should be authorized to exempt such gear from the herring savings closure. We suggest that §14.3.2(iii) and §14.4.1(ii) be modified by adding the following provision:

> "The herring savings closure applies to trawl gear only. Long line, pot or other gear types (including improved trawl gear approved by the Regional Director) which are not utilized to fish for herring or catch herring above trace amounts (less than 0.001% of total catch) are exempt from this time-area restriction."

Conclusion

We believe that the changes suggested would clarify and improve the herring FMP.

Thank you for this opportunity to express our views.

Very truly yours,

GARVEY, SCHUBERT, ADAMS & BARER

By
Stephen B. Johnson

KJD:je

(E)
Mick Stevens

Marine Resources Company

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Comments before Joint North Pacific Fishery Management Council

Alaska Board of Fisheries Public Hearing on

Proposed Revisions to Bering/Chukchi Sea Herring

Fishery Management Plan

Anchorage December 7, 1982

Mr. Chairman, Council and Board Members, my name is Mick Stevens and I am Operations Manager for Marine Resources Company, Inc.

For the past 4 winters we have attempted to gain permission and conduct an offshore fishery for winter herring as a food fish harvested by United States fishermen. We have been thwarted in our efforts at every turn by legal action, lack of proper Preliminary Management Plans and lack of fishery management plans. We are frustrated but not about to give up.

At the July meeting, the Council decided to pull the plan back from secretarial review to make some minor changes to solve one basic issue. We understood that the stated intentions of the Council was to not make major changes requiring substantial review. Council members expressed frustration that they had already spent so much time deliberating on this plan already that they weren't willing to entertain major revisions. Now we see the council has succumbed to pressure from one interest group and gone beyond their intentions by producing some revisions with significant connotations. We are

very disappointed.

From our viewpoint the plan as revised by the October 6 package is totally unacceptable. I would now like to highlight some of the problems we see with it.

1) The plan states that the maximum exploitation rate over the herring resource shall be 20%. A lengthy plan amendment would be required to change it, which means no opportunity for in season adjustment. This is too rigid and although you may want to manage at or below 20% as a guideline, the opportunity should exist for adjustment. If the biomass raises above MSY perhaps one should harvest more herring so that if a spawner-recruit relationship exists, it's possible to smooth out the peaks and valleys of the resource's abundance to provide for more stable conditions for the commercial industry.

2) The Plan provides no mechanisms for increasing optimum yield during the season. There is no upside potential, only downside potential exists. The revised package pays platitudes to a "framework plan" providing for "flexible management" and rapid incorporation of new data. This is hypocracy.

3) The single biggest problem with putting this plan together has been the lack of data and controvery over what data actually exists. This turmoil can be exemplified by comparing two biomass estimates which exist at the present time. The State

of Alaska Department of Fish and Game in its December 1982 "Report to the Alaska Board of Fisheries and North Pacific Fishery Management Council Concerning Bering Sea/Aleutian Islands Herring Management" on page 9 table 6 estimates the biomass of Pacific Herring in eastern Bering Sea for 1982 at 119,000 metric tons. These estimates come from observation of the spawning biomass inshore only. There is no attempt to adjust this estimate upward to include age 3 herring and the age 4 and above herring which don't happen to migrate inshore. At the same time 1982 "Northwest and Alaska Fishery Center Resource Survey Cruises during September-October, 1982" as reported by Vidar G. Wespestad and Jeffery June estimate the biomass of the herring resource for the survey area only between the Aleutian Peninsula and the Pribilof Islands at 168,698 metric tons. It is believed that the major offshore wintering grounds are located north of the Pribilofs. These grounds are located north of the Pribilofs. These differences in biomass estimates have yet to be reconciled.

You have moderate funding proposals to gain more data but even they are likely to not be met. You also have a proposal to hold up an offshore fishery for the next 5 years so that 1 million dollars can be spent on a tagging study or some such other thing. Even if the million dollars was available this would still be a step backwards. A test fishery, an

experimental commercial fishery at a moderate level, closely monitored and studied by the biologist is the only way, repeat only way to get the synoptically complete and useful information about what a commercial fishery out there will actually be like and its effect or lack thereof.

4) You also have heard the proposal that if there is any surplus following the inshore roe fishery then it's better to take the surplus in a summer food and bait fishery along the Peninsula than offshore in the winter. This is also an incomplete solution because a) U.S. catcher boats still need opportunities to expand their winter markets and an offshore herring fishery would promote faster development of pollock fisheries since pollock is also available in the same wintering areas. b) The large Togiak component of the resource probably makes up a larger percentage of the offshore stock than early scale analysis data shows of its percent composition along the Aleutian Islands summer grounds. Nelson Island and Port Moeller stocks are important components of this summer fishery and therefore it may be more delicately subject to adverse impact on the smaller components.

5) The results of the revision package indicate that herring will really no longer be a jointly managed resource with the

Board of Fisheries. This is of course counter to your previously often expressed objectives. The council no longer sets a total OY for this resource, rather only deals with the offshore component after the State has done whatever they want with it. Thus the Council has little authority to conserve the herring resource. Herring is biologically and managment-wise a resource of the Fishery Conservation zone as well as a resource of the territorial sea and state waters. These new revisions now go much further in reducing the chance of an offshore fishery under all conditions than it does in preventing overfishing. If the regions legal counsel is so concerned with reducing the possibilities of overfishing then let's not forget to talk about the need to scrutinize the State's management of the inshore fishery.

6) We understand the State's opposition and the Region's reservations to the previous plan originated from concern over a worst case scenario. In a year in which the ice remains late on the spawning grounds, or in which weather prevents an effective onshore fishery, strict adherence to the ABC and OY formulas of the plan would provide for a substantial offshore fishery. Risk of fishing of individual stocks (assuming they really exist) might be increased. Therefore, the State wanted some mechanism in the plan so that the Secretary would have discretion in reducing the level

of any offshore allocation. Since the offshore fishery wouldn't legally open till autumn there would be sufficient time following the aborted inshore fishery to decide the details.

However, the October 6 revision package goes considerably beyond just addressing this particular issue. Provisions now allow for an automatic dividing by two or cut-in-half of whatever might remain following an inshore fishery, then subtracting the AIC whether it is actually harvested or stays swimming around at sea. The remaining pittance then has 2,000 ton and 10,000 ton limits imposed upon it. Never less than 2000 tons and never, repeat never according to this plan will the winter apportionment be allowed to exceed 10,000 metric tons. Mr. Chairman, the absurdity of these conditions is that now they apply under all possible scenarios, not just under the worse case scenario which prompted the quest for revisions in the first place. Further, there is an additional condition that "under exceptional circumstances" these amounts can be further reduced by NMFS. I find the imbalance incredible.

8) The mechanics of the computations for a winter offshore allocation taking into consideration the findings of your Scientific and Statistical Committee, show that allocations are being made for the sake of allocation. Allocations are

being made for political reasons to hopefully try to prevent a lawsuit by the western Alaska Natives together with the State of Alaska. Your scientific experts have told you in written reports and public testimony that there is no scientific basis for dividing by 2 and placing 2000 and 10,000 ton limits on the offshore fishery if a surplus exists. Your scientists have told you there is little risk of overfishing even if the entire OY is harvested offshore because of all the conservative factors incorporated into the plan already. They have even gone on record stating that they see these revisions are not conservationally motivated or justifiable, rather they are politically motivated.

Judging from this record and the wording of National Standard #4 which requires all FMP's to be "reasonably calculated to promote conservation" it seems clear that with these revisions the plan can be shown to violate this edict.

8) Mr. Chairman, it also should be pointed out that with this revision package in place and under any condition where the inshore fishery does harvest the ABC and offshore allocation is warranted, it is virtually guaranteed that the OY for the overall herring resource cannot be achieved. By dividing by 2 and placing a 10,000 mt cap on any further harvest you have institutionalized underharvesting.

9) The Council has maintained consistently that they wanted joint management over herring and that they wanted to provide for the opportunity for an offshore harvest under certain conditions. What I see in the revision package now is that the council has relinquished so much management control to the State and accepted such a rigid formula for allocating offshore that likely 9 years out of 10 or even more you won't have any offshore fishery at all. Politically, that satisfies some interests but unless your objectives have changed for which you haven't announced publicly from a management point of view, I think you have to recognize that you have failed to balance the multiple interests at all. Practically speaking, there is no balance, it is all one sided.

10) I think the National Marine Fisheries Service, Alaska region and the Council made a mistake when they succumbed to pressure from legal advisers and the State and revised the mechanics of allocating herring to an offshore fishery under the guise of providing necessary protection from overfishing. The plan is now worse and less defensible than it was before. The previous plan might have passed through Washington but the fear was that a lawsuit would result. The new revised plan couldn't possibly even pass through Washington successfully and I can most definitely assure you that it will see legal action against it if it is implemented.

11) To take a constructive turn we have a proposal which could perhaps best be blended into the previous plan that was sent at one time to the Secretary. Text of the proposal is included as Appendix I. Our proposal involves an experimental winter offshore fishery at a moderate level of 10,000 metric tons for each of the next three years. Results would be assessed and the future of any offshore fishery would then be completely open. Within this experimental fishery harvesting and processing platforms would be provided free of charge to State and Federal biologists for scale analysis studies, wire coded tagging experiments, electrophorisis genetic studies, biomass estimates or any type of research desired. We feel this offers the best practical opportunity for synoptically valuable information to be provided.

Thank you for the opportunity to present these comments.

APPENDIX I

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PROPOSED ADJUSTMENT OF BERING/CHUKCHI SEA FMP

PURPOSE: To resolve the present conflicts about procedures for allowing or not allowing an offshore domestic fishery for herring. This Proposal is a compromise approach intended to balance the interests and concerns of the parties on both sides of this question. This amendment if accepted may also substantially reduce the likelihood that the plan will be contested in court of law by one or both of the parties.

TEXT: In the first three years following the implementation of this FMP an offshore domestic fishery at the minimum level of 10,000 tons will be authorized on an experimental basis. The fishery will be authorized for the period October through April and shall be conducted north of 56° 00' N Latitude in the Bering Sea. If on a year by year basis the inshore fishery significantly underharvests the resource then the Secretary/Council/Regional Director may increase the allocation to the domestic offshore fishery up to a maximum limit of 50% of the relevant final OY. At the end of this three period the impact and benefits of this experimental offshore fishery will be evaluated to determine the future of such an allocation approach.

RATIONALIZATION:

1) Proposal suggest a rather moderate level for the offshore fishery. Some minimum quantity must be assured to give the catching and processing industry an opportunity to gain experience with the species as a food fish: where and how to catch it, what the concentrations are like, how to handle and process it together with the very important task of exploring and developing diverse markets. With the many conservative factors already incorporated into the plan for determining biomass estimates, setting exploitation rates and other management measures this level of allocation seems quite defensible from a biological point of view.

PROPOSED ADJUSTMENT OF BERING/CHUKCHI SEA FMP

(continued)

RATIONALIZATION:

2) The allocation is not permanent. After three years it may be eliminated or modified if necessary.

3) If evidence exists or can be generated thru monitoring of the limited offshore fishery, while it is in process, that there exists discrete spawning stocks mixing in offshore areas which are significantly and adversely impacted by the offshore fishery then the Council/Regional Director/Secretary may have in season control and make changes.

4) The domestic trawler fleet is in dire need of any and all kinds of markets, particularly as a result of the very poor prospects over the next few years for sustaining income from the crab fisheries.

5) The council has established a precedent for allowing a "domestic fishery on an experimental basis" in an area of domestic concern over species composition. The Bering Sea/Aleutian Island FMP provides for domestic trawling "on an experimental basis" within the pot sanctuary.

6) Given the lack of significant risk in conducting an offshore fishery at moderate levels the ultimate justification for this experimental fishery is the opportunity to generate useful data. Nobody can argue that many of the most difficult problems associated with finalizing this plan result from lack of data. An offshore fishery offers the very best opportunity to generate some of this needed data. Fishery managers must of course base their decisions on the best data available. Responsible management however should seek out and encourage the generation of this data so that the largest possible base of objective information is available for consideration.

2 December 1982