AGENDA E-2
December 1980

M E M O R A N D U M

TO: Council, SSC and AP Members

FROM: Jim H. Branson
Executive Director

DATE: December 2, 1980

SUBJECT: Herring Fishery Management Plan

ACTION REQUIRED

Decision on the Herring Savings Area and approval of the Herring Fishery Management Plan.

BACKGROUND

After an extensive public comment period ending March 15, 1980, the draft fishery management plan was revised and presented to the Council in September, 1980. Following the recommendations of the Council to clarify the management measures section (Section 14.0) of the plan, the Plan Drafting Team has resubmitted the plan to the Council for their review and approval for forwarding to the Secretary. Attachment I is a summary of the herring plan.

The option on the configuration of the Herring Savings Area has still to be selected by the Council. Attachment II summarizes the options for a Herring Savings Area.

ATTACHMENT I

SUMMARY OF BERING/CHUKCHI SEA HERRING FISHERY MANAGEMENT PLAN

2.0 SUMMARY

The Fishery Conservation and Management Act of 1976 as amended, requires each Regional Council to prepare Fishery Management Plans for all fisheries within its area of jurisdiction in the Fishery Conservation Zone (FCZ) from 3 to 200 miles. The purpose of the plan is to provide for an optimum yield of the resource to the fishermen and to the nation, and to promote fair and equitable allocation of the resource.

The herring plan has been developed by the North Pacific Council with the assistance of the Alaska Department of Fish & Game and the National Marine Fisheries Service as a framework which will provide the methodology for management of the fishery on a multi-year basis.

The domestic inshore fishery has been managed by the State of Alaska since the fishery developed in 1977. The plan establishes a cooperative management policy of the North Pacific Council, State of Alaska Board of Fisheries and the National Marine Fisheries Service, and provides the basis for management measures and regulations for the resource over a period of several years.

After a long public comment period, the draft fishery management plan has been modified to incorporate decisions on options and alternatives, with the exception of the final decision on the implementation of the herring savings area. The plan proposes the following:

2.1 Management Objectives

The plan proposes the following objectives:

(a) To maintain the herring resource at a spawning biomass level that will provide the maximum production of recruits to the population on an annual basis.

(b) To maintain the herring resource at a level that will sustain populations of predatory fish, birds and mammals.

(c) To maintain the herring resource at a level that will enable the traditional subsistence fishery to harvest herring in the amounts necessary for subsistence purposes.

(d) To promote full utilization of the herring resource by domestic fisheries.

(e) To encourage development of herring fisheries in Western Alaska.

(f) To provide, to the extent possible, a unified management regime between Federal and State jurisdictions.

Together, these management objectives suggest that priority should be given to the various herring fisheries in the following order:

(a) the inshore subsistence fishery;

(b) the inshore roe fishery;

(c) the offshore domestic food and bait fishery; and

(d) the offshore foreign food and bait fishery.

2.2 The Fisheries

The subsistence fishery is conducted within territorial waters from the coast of the Alaskan Peninsula to the southern part of the Chukchi Sea, with varying degrees of local dependency on the resource. This is a small spring and summer gillnet fishery (average annual catch from 1975-1978 was 100 metric tons) for herring for personal use.

The domestic commercial herring fishery includes a spawn-on-kelp fishery (1978 catch was 153.0 mt worth $124,000) and a developing herring sac roe fishery (1978 catch was 7,305 mt worth $2.4 million). Both fisheries are conducted in a short early summer season, generally by off-season salmon seiners and gillnetters, within territorial waters. There is also a small bait and food fishery.

Japan and the U.S.S.R. have been the historic participants in the directed distant water herring fishery conducted primarily northeast of the Pribilof Islands. Catches have declined since the peak in the late 1960's and early 1970's (Japanese catch in 1968-1969 was 50,857 mt, Soviet catch in 1969-1970 was 92,228 mt, foreign fleet total in 1968-1969 was 128,230 mt). A Preliminary Fishery Management Plan (PMP) for trawl fisheries and herring gillnet fisheries in the Bering Sea and Aleutian Islands was implemented in 1977. Due to present catch quotas the herring caught by the foreign fleet is incidental to the winter pollock trawl fishery. Since a court order was issued in February, 1980, herring are a prohibited species, i.e. any herring caught by the foreign fishery must be thrown back and not retained. This order also terminated plans for pioneering joint venture operations with Soviet processing vessels for 1980.

2.3 Estimation of Yield

The fishery management plan must assess and specify the Maximum Sustainable Yield (MSY) over a continuing period of time. MSY is based on an assessment of biomass. Biomass of the Bering Sea herring stocks wintering off the Pribilof Islands was estimated using data from Soviet hydroacoustic trawl surveys (1965, 1978) and from ecosystem modelling (1978). MSY was calculated from average annual foreign fishery catch from 1962 to 1976 which is equal to 48,186 from an estimated biomass of 240,930 mt, at an exploitation rate of 20%. This estimate may be conservative and may be revised as additional research and catch information become available. The biomass level that will produce MSY over the long term will fluctuate according to growth, recruitment and mortality factors.

The annual estimate of the acceptable biological catch (ABC) will be calculated by applying an appropriate exploitation rate to the best available estimate of spawning biomass. This rate will be adjusted by the ratio of current biomass to MSY biomass each year. Spawning biomass surveys are based on aerial survey counts of herring schools with the greatest amount of available information from the Bristol Bay/Good News stock grouping, the Kuskokwim/Yukon River Delta and the Norton Sound stock grouping. These tentative stock groupings are based on similarities of distribution, behavior, utilization and abundance. Estimates are not available for the Aleutian/Alaska Peninsula stock grouping nor the Port Clarence/Kotzebue Sound stock grouping, neither of which are being currently commercially exploited. Allowable Incidental Catch (AIC) is calculated from available observer data and subtracted from ABC before OY is determined. It applies to both foreign and domestic groundfish fisheries for the fishing year beginning April 1.

The Optimum Yield (OY) is estimated by modifying MSY and ABC for socio-economic reasons. OY is estimated in two parts, at the beginning of the roe season (preliminary OY) and before the winter fishery (final OY). The priorities of allocation and the sequential occurence of the fisheries require a system of in-season management for timely allocation based on current stock assessment information. The preliminary annual estimate of OY will be established in September from the ABC estimate, using an appropriate exploitation rate. Preliminary allocations for the period April 1 to September 30 will be made to the domestic food and bait fishery and the remainder to the roe fishery. Final allocations based on surplus stocks will depend on condition of stocks and performance of the fisheries (see Section 14.2).

2.4 Allocation of OY to the Fisheries

2.4.1 Fishing year. April 1 to March 31

A fishing year commencing April 1 coincides with the migration of herring into coastal waters for spawning and is a natural division between the fisheries occurring on the winter grounds and those on the spawning grounds.

2.4.2 Allocation of preliminary OY

In September, a preliminary estimate of OY will be developed by a herring management team appointed by the Council, for the fishing year beginning the following April. The team will consist of representatives from the National Marine Fisheries Service, the Alaska Department of Fish & Game, and other individuals that the Council may wish to appoint.

The team will analyze all biological and fisheries data relevant to determination of ABC. Following the determination of ABC, the team will make an estimation of Allowable Incidental Catch (AIC) (for the following fishing year, April 1 to March 31) which is deducted from ABC, (see Section 9.6.2.4).

The team will also evaluate all socio-economic data available to it for determination of a preliminary OY (Section 12.0) for the following fishing year. The preliminary OY will be presented to the Council and the Alaska Board of Fisheries for review.

After the establishment of a preliminary OY, allocations will be made to the individual fisheries in the following order:

(a) Domestic Offshore Food and Bait Fishery

An allocation will be made to the domestic food and bait fishery for the period April 1 to September 30. This allocation is primarily to provide for current domestic food and bait fisheries. For the immediate future, this allocation will be no greater than 2,000 mt.

(b) Domestic Inshore Roe Fishery

The remaining portion of the preliminary OY will be allocated to the inshore domestic roe fishery.

2.4.3 Determination and allocation of final OY

By September 30 of the current fishing year, the herring management team will evaluate biomass estimates, biological parameters, ecological factors and socio-economic data to formulate a final OY for the current fishing year, which will also be the preliminary OY for the following fishing year.

(a) Domestic Offshore Food and Bait Fisheries

If a harvestable surplus is available to the food and bait fishery following the roe fishery, fishing will be allowed throughout the FCZ until the end of the fishing year, March 31 or until the allocation is harvested.

The amount to be allocated to the domestic food and bait fishery will be determined by an intent to operate filed before the start of the winter season by processors and fishermen.

If there is no surplus, then the food and bait fishery will be allowed to harvest its initial allocation, unrestricted.

If, after the roe fishery, there is no surplus OY, or there is only a very small surplus OY that cannot be controlled by the regulation of a large fishing fleet, ie. the fishing effort is such that the OY can be taken within a reporting period, then domestic and foreign fisheries having the potential to take herring will be closed to offshore areas of herring concentrations (see Section 14.3.2.).

(b) Foreign Fisheries

If domestic fisheries utilize all of the OY then only the remainder of the foreign Allowable Incidental Catch will apply for the remainder of the fishing year.

Any OY remaining following domestic food and bait allocation will be allocated to foreign fisheries.

If domestic fisheries are not active in December and there are no indications that domestic herring fisheries will be actively engaged during the remainder of the fishing year, all or a portion of the remaining domestic

food or bait allocation will be released to the foreign fisheries. The Regional Director, in consultation with the Council shall make the release from DAH to TALFF by January 30.

2.5 Management Measures for Domestic Fisheries

2.5.1 Inshore roe fishery

i. Provisions for allocation. See Section 14.2.2(2).

ii. Regulations for the orderly conduct of the inshore roe fishery shall be promulgated by the State of Alaska Board of Fisheries.

iii. The FCZ will be closed to directed herring fishing from the beginning of the fishing year, April 1 to July 1, south of 60° N latitude and to August 1, north of 60° N latitude.

Rationale

The roe fishery is currently managed by the State of Alaska and all fishing activity occurs within State waters. It is expected that the roe fishery will continue inside of three miles in the future since roe quality and recovery rates are greatest in close proximity to the spawning grounds. It is desirable to continue restricting the roe fishery to State waters because product quality will be highest, management and regulation of the fishery will be simplified, aerial biomass surveys will be more easily performed, and fishing on discrete stocks is facilitated. Management of the roe fishery is based on the following considerations:

(a) the effect of overall fishing effort;
(b) the catch per unit effort and rate of harvest;
(c) the relative abundance of herring in comparision with pre-season expectations;
(d) the performance of the roe fishery;
(e) the proportion of immature or spawned out herring;
(f) general information on the condition of herring;
(g) information pertaining to the optimum yield for herring;

(h) timeliness and accuracy of catch reporting by buyers to the extent that such timeliness or accuracy may reasonably be expected to effect proper management; and

(i) any other factors necessary for the conservation and management of the herring resource.

These considerations allow adjustment of harvest levels during the fishery and are the basis for development of preliminary and final OY's.

The third management measure will prevent a targeted fishery on herring occuring on stocks immediately prior to spawning in order to allow the inshore fishery the maximum opportunity to harvest the spawning stocks.

2.5.2 Offshore food and bait fishery

i. Provisions for allocation, see sections 14.2.2.(1) and 14.2.3.(1).

ii. The FCZ will be closed to directed herring fishing from the beginning of the fishing year, April 1 to July 1, south of 60° N latitude and to August 1, north of 60° N latitude. However the Regional Director in consultation with ADF&G and the Council may open the FCZ by emergency regulation if ice conditions or other factors preclude full development of the roe fishery within state waters.

Rationale

See the rationale discussed above.

iii. The Herring Savings Area as described in Appendix 18.10 will be implemented by the Regional Director, in consultation with the Council if:

a. There is no surplus OY, remaining initial 2000 mt allocation, or remaining AIC.

b. The amount of surplus OY, or remaining initial allocation, or remaining AIC can be harvested within one reporting period.

Rationale

If it is determined that there is no surplus OY, the Herring Savings Area Closure would be implemented to protect the feeding stocks against further harvesting by the winter fisheries. If there is a small amount of surplus OY outstanding that can be taken in one reporting period an in-season closure could be implemented by the Regional Director in order to avoid exceeding the OY between reporting periods (see In-season Adjustment of Time and Area, Section 14.5).

2.5.3 Other regulations

Regulations in the Bering Sea/Aleutian Islands Groundfish FMP for time and area closures shall also apply to all herring fisheries. (Figure 25, Appendix ~~18.10.~~). ~~Trawling for~~ herring in the Bristol Bay Pot Sanctuary will only be allowed during the open season for crab. Domestic trawling for herring in the Winter Halibut-savings Area will not be allowed after the domestic catch of groundfish in this area exceeds 2,000 mt.

Rationale

Any herring fishery in the FCZ is conducted in conjunction with both domestic and foreign groundfisheries. The restrictions on groundfishing operations have been developed to protect incidentally caught species and prevent gear conflicts. As herring fishing gear is similar to groundfishing gear (e.g. pollock), the herring fishery has potentially the same impact. Thus, the Bering Sea Groundfish FMP implementing regulations shall also apply to the herring fisheries to minimize adverse impacts and to maintain consistency of regulations.

2.5.4 Statistical reporting requirements

Landings must be reported on a fish ticket as required by the State of Alaska commercial fishing regulations (Appendix 18.6) or on an equivilant form. Fishery data compiled for the domestic herring fishery should have the following precision: catch by species, by ½ degree latitude x 1 degree longitude areas, by gear type and vessel class, and by month; effort (e.g., hours towed, number of landings, number of trips) by gear type and vessel class, and by month.

2.5.5 Permit requirements

All U.S. vessels operating in the FCZ portion of the Bering/Chukchi Sea must have on board a permit issued by the Secretary of Commerce or a State of Alaska vessel license.

2.6 Management Measures and Rationale for the Foreign Fishery

2.6.1 Existing area closures

i. Fishing for herring is not allowed within 12 miles of the baseline used to measure the Territorial Sea, except in certain waters adjacent to the western Aleutian Islands (Appendix 18.10).

ii. No foreign vessel may fish for herring east of 168° W longitude to prevent over exploitation of herring stocks important to U.S. coastal residents from Bristol Bay to Norton Sound.

Rationale

These measures prevent conflicts with U.S. fixed gear and small, inshore fishery vessels and also prevent the catch of herring and localized inshore species important to US fishermen and natives.

iii. The Bering Sea/Chukchi Sea management unit (or individual subareas) will be closed to all fishermen of a nation for the remainder of the fishing year when that nation's allocation of herring is exceeded.

Rationale

This will discourage foreign fleets from covertly targeting on depleted stocks and prevent damaging by-catches after the allowed catch has been taken. This provision places the burden of responsibility on foreign fleets to avoid taking herring stocks and to develop fishing gear and fishing practices which will minimize or eliminate their incidental capture.

iv. Time/area closures specified in the implementing regulations of the Bering Sea/Aleutian Islands Groundfish Fishery Management Plan apply to herring fishermen using trawl gear in the Bering Sea/Aleutian Island area. (See Section 18.10 and Figure 26 for specifications.)

v. The Herring Savings Area closure, as described in Appendix 18.10 will be implemented by the Regional Director, in consultation with the Council if:

a. There is no surplus OY or remaining AIC.

b. The amount remaining can be harvested within one reporting period.

Rationale

The purpose of a proposed time/area closure is to minimize the incidental catch of herring by foreign fisheries. An in-season closure provision is necessary to allow the Regional Director to act within a reasonable amount of time to protect herring stocks from being over harvested during one reporting period (see Section 10.3).

This closure applies to trawl gear only. Longline, Pot or other gear which are not utilized to fish for herring or catch herring above trace amounts (less than 0.001% of total catch) are exempt from time-area restrictions.

2.6.2 Foreign reporting requirements

The operators of all foreign vessels must maintain an accurate log of catch and effort information in accordance with the requirements of the implementing regulations of the Preliminary Fishery Management Plan for Trawl Fisheries and Herring Gillnet Fishery in the Eastern Bering Sea and Northeast Pacific and Amendments; (See also, Foreign Fishing Regulations, CFR 611.9).

2.6.3 Permit requirements

All foreign vessels operating in this Management Unit must have on board a permit issued by the Secretary of Commerce as required by the FCMA.

2.6.4 Prohibited species

The retention of salmon, steelhead trout, halibut, Tanner crab, king crab, coral, shrimp, clams, horsehair crab, lyre crab, or Dungeness crab, or continental shelf fishery resources is prohibited. This prevents covert targeting on species of importance to the US fishermen.

2.7 In-season Adjustment of Time and Area

The Regional Director of the National Marine Fisheries Service, Alaska Region, or his designee, may issue field orders adjusting time and/or area restrictions.

ATTACHMENT II

HERRING SAVINGS AREA OPTIONS

HERRING SAVINGS AREA OPTIONS

Background

The August 1979 Draft of the Bering Sea Herring Fishery Management Plan proposed four options for a proposed herring time-area closure. Supportive analytical data for each option consisted of the historical percentage of herring harvested in each area and the historical percentage of pollock (the other major species harvested in the time-area closures) harvested as an indicator of impacts on other fisheries of instituting a time-area closure.

In reviewing the options for selection of a time-area closure, the SSC expressed the opinion that the data present were inadequate for evaluating the options, and additional data should be provided. This paper provides additional data on the catch of herring and groundfish by time and area.

Purpose of a Closure

The purpose of the proposed time-area closure is to minimize the incidental catch of herring by foreign fisheries in the event that there is no TALFF, no Allowable Incidental Catch (AIC) or remaining 2000 mt allocation, or if the remaining allocation could be harvested within one reporting period. The four proposed areas are shown in Figure 1, and relative area comparisons are shown in Figure 2.

Impact Analysis Data Base

To compare the effectiveness of each closure for herring protection, data supplied to the U.S. by Japan were used. The Japanese data cover the years 1968 through 1978 and contain catches by species, month, 1° longitude by 1/2° latitude, and vessel class. Comparable data are not available from the Soviet fishery; therefore, the Soviets are assumed to have operated in the same areas as the Japanese. U.S. surveillance reports indicate that the Japanese and Soviet herring fisheries did operate in the same general area.

Areas were selected on the basis of catch in 1968-1972. In these years, catches were high, most herring were taken as the target species, and there were no catch quotas or regulations to influence fishing. In subsequent years catches have been low, influenced by declining stocks or quotas and regulations. The boundaries of the potential closure areas follow lines of latitude and longitude as much as possible to minimize future enforcement efforts, although, by doing so, some blocks are included in which herring have not been caught.

Table 1 contains the catch of herring within each area for the November - March period that the closures would be in effect, total Bering Sea herring catch for gear other than gillnet for the November - March period, and the annual herring catch for the years 1968-69 to 1977-78. Mean catches were computed for the entire data series and for the years 1968-69 to 1971-72. The latter series is believed to be more indicative of the amount of protection to herring stocks by each time-area closure, because in these years stocks were high, regulations did not exist, and herring was a target species to a greater degree than in later years.

Results

1. Impact on harvest of herring

The 1968-69 to 1971-72 data show that 90% of the Bering Sea herring catch occurs from November - March and that 88-95% of this catch is taken within the proposed herring time-area closure (Table 1).

Area C (the largest area) provides the greatest protection, accounting for 95% of the average November - March catch and 85% of the average annual catch.
Area B (the smallest area) provides the least protection, accounting for 88% of the November - March catch and 79% of the average annual catch.
The other two areas (A and D) are intermediate to B and C and account for 93% and 94% of the average November - March catch and 83% and 84% of the average annual catch, respectively.

The variation in amount of herring protection provided by the four areas is non-significant, since historically the greatest herring harvest has been in B, the smallest area. However, there are significant differences in relation to the total groundfish catch and pollock in particular.

2. Impact on harvest of groundfish

Table 2 shows that of the total Bering Sea groundfish harvest, an average of 16.5% of the catch is taken during November - March. The proportion of groundfish caught in the proposed closed areas, relative to the November - March harvest in the Bering Sea, ranges from 6.3% in Area B to 24.1% in Area C. Of the total annual harvest, 1-4% is caught in the proposed closed areas.

3. Impact on harvest of pollock

The pollock catch record is more meaningful than the total groundfish harvest, because it is the principal target species in the areas proposed. Pollock comprised 77% of the average November - March Bering Sea catch, and pollock and herring combined averaged 83% of the Bering Sea winter groundfish harvest from 1968-69 to 1977-78.

The relationship of harvest between areas is the same for pollock as for groundfish, but the percentage of catch drops sharply in Areas A and B, primarily because herring, included in the total groundfish catch, was the major species, along with pollock, harvested in these area (Table 3).

In Area C the impact to existing fisheries would be greatest. This area produced an average 21.4% of the November - March pollock catch during 1968-1978.
Area B would have the least impact with 1.8% of the November - March average pollock harvest.
Area A and D averaged 5.7% and 15.7% respectively.
Area C would result in the reduction of the Japanese pollock harvest on an annual basis by 3.2%.
Area D would result in an annual reduction of 2.3%.
Area A - would result in an annual reduction of 0.8%
Area B - would have the least impact on pollock harvest. This area averaged a catch of 0.3% of pollock by the Japanese annually.

This analysis is based on Japanese data, and measures impact to Japanese fisheries only. The USSR has also conducted a major fishery in the areas analyzed. U.S. observer data (Herring draft FMP Sec. 10.3) and historical catch data show that much of the Soviet effort in these areas has been directed toward herring and that the ratio of herring to pollock and groundfish is much higher than for Japan. Therefore, if USSR data had been available, the amount of herring protection would have been greater in each area and the overall impact to other fisheries would have been less.

Conclusions

Since all areas are nearly equal in the amount of protection to herring, the herring PDT recommends Area A for the November - March period, because it includes most of the herring winter range and has a minimum impact on the pollock fishery. The PDT is also in favor of instituting Area C (which includes almost the entire herring winter range) as a general closure, with the provision that only the portion necessary to protect herring be closed annually by emergency order. The Regional Director could close the entire area or a portion of it, when 75-80% of the allowable incidental catch is reached, utilizing observer data and vessel position data. Impacts of these closures are summarized in Table 4.

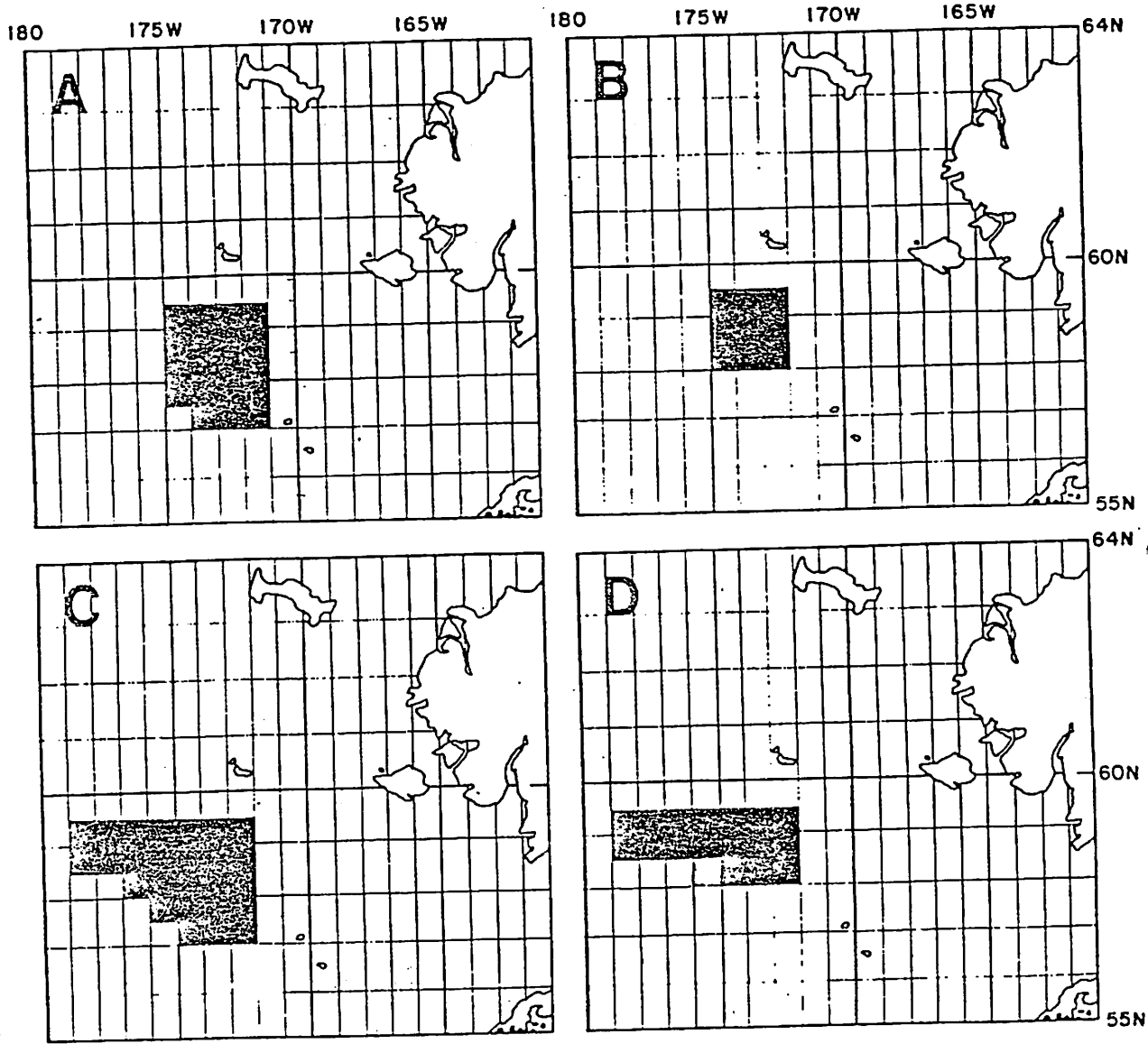

Figure 1 Herring savings area options.

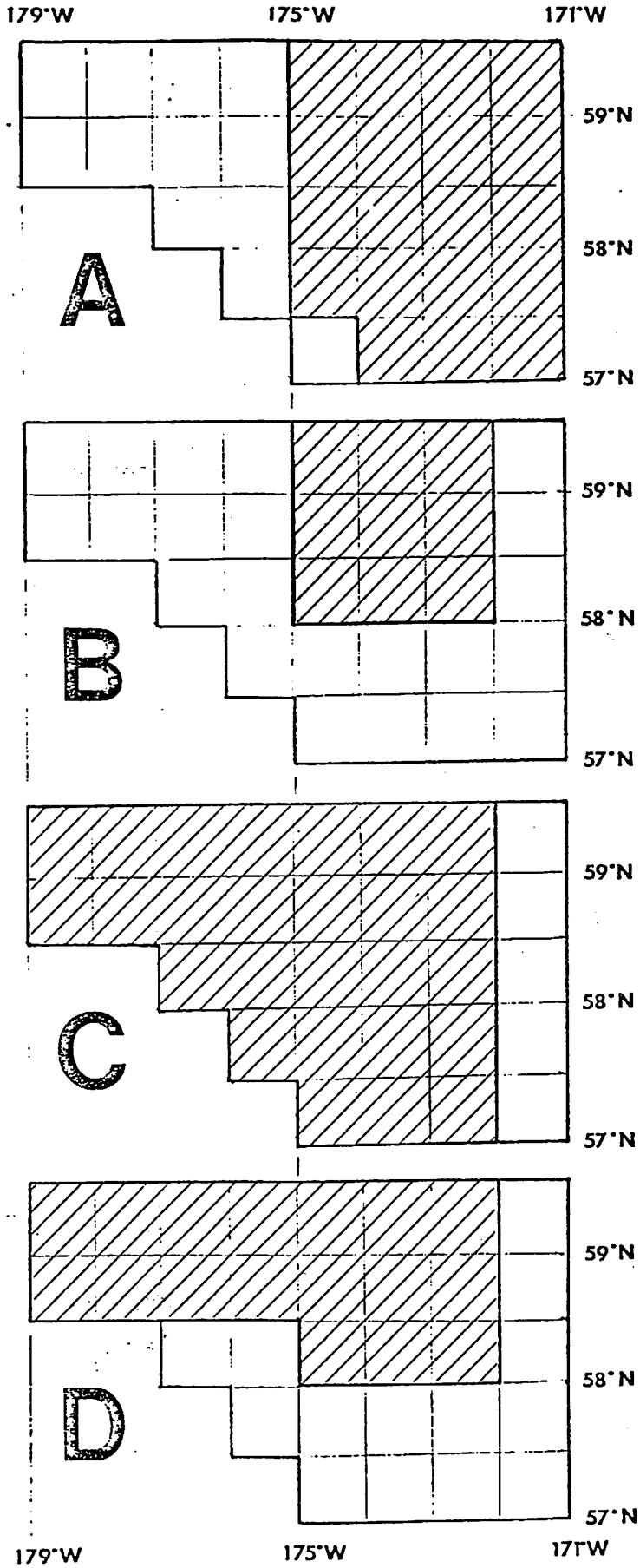

Figure 2 Herring savings area options = Relative area comparisons.

Table 1. Japanese herring catch in the proposed November-March time-area closures and the eastern Bering Sea and the mean catch and mean percentage of the Bering Sea annual and November-March catch for the years 1968-69 to 1971-72 and 1968-69 to 1977-78.

	Herring Catch (mt) by Area					
					Bering Sea	
	A	B	C	D	Nov.-March	Annual (Jul.-June)
1968-69	40316	40273	40470	40436	41875	50857
69-70	20925	17045	19338	17165	22274	23901
70-71	19415	19298	22935	22737	23717	24236
71-72	12301	11748	12532	11978	12889	13143
72-73	18	18	18	18	435	346
73-74	21	14	94	91	620	219
74-75	17	16	123	115	1569	2663
75-76	5	0	296	291	612	3119
76-77	4929	4858	8424	7873	2127	13413
77-78	4	5	431	375	1257	2703
Mean Catch:						
1968-69 to 71-72	23240	22091	23821	23581	25118	28034
1968-69 to 77-78	9795	9327	10467	10109	11737	13460
Mean(%) of Bering Sea November-March Catch:						
1968-72	93	88	95	94		
1968-78	84	80	99	86		
Mean(%) of Bering Sea Annual Catch:						
1968-72	83	79	85	84	90	
1968-78	73	69	78	75	87	

Table 2. Japanese total groundfish (including herring) catch in the proposed November-March time-area closures and the eastern Bering Sea and the mean catch and percentage of the Bering Sea annual and November-March catch for 1968-69 to 1977-78.

	Groundfish Catch (1000 mt) by Area					
					Bering Sea	
	A	B	C	D	Nov.-March	Annual
1968-69	44.5	44.4	44.7	44.6	160.0	878
69-70	31.3	20.7	28.6	20.9	180.4	1036
70-71	38.1	24.5	42.4	28.6	264.1	1447
71-72	34.2	16.7	53.6	34.2	305.3	1782
72-73	14.9	6.6	44.0	29.2	257.7	1844
73-74	6.6	6.7	109.1	95.2	245.0	1726
74-75	21.2	4.9	61.9	37.4	191.7	1487
75-76	14.0	0.8	32.2	13.2	297.1	1278
76-77	18.9	13.3	52.0	41.6	157.8	1062
77-78	2.7	1.2	69.3	57.2	174.1	957
Mean Catch:	22.6	14.0	53.8	40.2	223.3	1350
Mean (%) of Bering Sea November-March Catch:	10.1	6.3	24.1	18.0		
Mean (%) of Bering Sea Annual Catch:	1.7	1.0	4.0	3.0	16.5	

Table 3. Japanese pollock catch in the proposed November-March time-area closures and the Eastern Bering Sea and the mean catch and percentage of the Bering Sea annual and November-March catch for 1968-69 to 1977-78.

	Pollock Catch (mt) by Area				Bering Sea	
	A	B	C	D	Nov.-March (1000 mt)	Annual (1000 mt)
1968-69	3317	3270	3364	3317	97.9	701
69-70	2416	592	2323	591	122.2	830
70-71	11601	1322	11464	1337	187.2	1231
71-72	18417	4598	35505	20348	242.6	1513
72-73	12820	5715	40024	26988	214.2	1651
73-74	5889	5191	102438	90713	201.7	1476
74-75	18923	4468	46942	34768	157.4	1253
75-76	11106	660	26103	11104	246.4	1137
76-77	10258	1156	36887	28586	113.9	913
77-78	2478	3483	60393	51011	125.1	869
Mean Catch:	9723	3046	36544	26876	170.9	1158
Mean (%) of Bering Sea November-March Catch:	5.7	1.8	21.4	15.7		
Mean (%) of Bering Sea Annual Catch:	0.8	0.3	3.2	2.3	14.8	

Table 4. Summary of Impacts

	A.	B.	C.	D.
Herring Catch November - March	93%	88%	95%	94%
Herring Catch Annual	83%	79%	85%	84%
Groundfish Catch November - March	10.1%	6.3%	24.1%	18.0%
Groundfish Catch Annual	1.7%	1.0%	4.0%	3.0%
Pollock Catch November - March	5.7%	1.8%	21.4%	15.7%
Pollock Catch Annual	0.8%	0.3%	3.2%	2.3%

ATTACHMENT III

SEP 29 1980

ACTION	ROUTE TO	INITIAL

P.O. Box 3-3908
Anchorage, Alaska 99501

September 29, 1980

Jim H. Branson
Executive Director
North Pacific Fishery Management Council
P.O. Box 3136DT
Anchorage, Alaska 99510

Subject: Bering Sea/Chukchi Sea Herring Draft Fishery Management Plan

Dear Mr. Branson:

At the Council's meeting in Sitka on September 26, 1980, I made a presentation concerning the mechanics of the implementation of a herring savings area in the Bering Sea. Specifically, I discussed the question of the protection of the smaller stocks of herring during a winter high seas directed herring fishery. This issue which I have raised before the Council in the past will now be, in my understanding, the subject of further investigation by the Plan Development Team.

It was my intention at the time that I raised this issue that it become part of the agendas of both the Scientific and Statistical Committee and the Advisory Panel during the October Council meeting. From a discussion with persons in the audience in Sitka, it was their impression that I only wanted consideration of the issue by the SSC. If that was your understanding as well, I would like to make certain that the AP also has the opportunity to discuss and recommend action on this problem to the Council.

Further, as this will be the final consideration of the herring FMP by the Council before sending it on to the Secretary of Commerce, it would be very helpful to the public if the final plan could be circulated at least two weeks before the October meeting. There are many significant issues still unresolved in the plan and two to three weeks would provide adequate time for review and then final comment to the Council before their final approval.

Thank you for your consideration of these matters.

Very truly yours,

Norman A. Cohen

Godfrey
12/3/80

PACIFIC HERRING STOCKS AND FISHERIES IN THE EASTERN BERING SEA

A Report to the Alaska Board of Fisheries

December 1980

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INTRODUCTION

The 1980 inshore domestic commercial fisheries for Pacific herring in the eastern Bering Sea harvested 21,582 mt of herring and 108 mt of spawn on kelp worth approximately $4.1 million and $168,000 to the fishermen, respectively. 1/ Subsistence fisheries in Yukon-Kuskokwim delta region harvested an estimated 110 mt of herring. While the volume harvested commercially increased substantially from the 1978 and 1979 levels, the value of the catch to fishermen declined due weakness of the market. Furthermore an overall decline in the abundance of herring was noted, which reflected a drastic decline of most populations south of the Yukon River. Populations farther north remained stable or increased.

The following report summarizes current data on the eastern Bering Sea herring stocks and fisheries and is composed of three main sections. The first section reviews the methods and results of abundance and age composition assessment. The second section reviews the trends of the Western Alaska subsistence fishery for herring. The third section reviews the characteristics of the 1980 commercial fisheries and management strategies for the 1981 season on a district-by-district basis. Figure 1 shows the location of the fishing districts in the eastern Bering Sea.

1/ All 1980 catch data in this report are preliminary.

STATUS OF THE STOCKS

SURVEY AND SAMPLING METHODS

The basic methods of data collection used for stock assessment in 1980 were identical to those used in 1978 and 1979. Repeated aerial surveys were conducted over the spawning grounds to determine number, size, and location of fish schools. Occurrence and extent of spawn or milt were also noted, as well as fishing effort and visibility factors affecting the quality of the survey. Test fishing with variable mesh gillnets was conducted on the Togiak, Security Cove, Cape Romanzof and Cape Denbigh (Norton Sound) fishing grounds to collect herring samples for age, weight, sex and maturity analysis and also to determine relative abundance of other schooling fishes (capelin, smelt, sand lance and cod) which might be mistaken for herring by aerial observers. In the Togiak District, after fishing was halted by emergency order on May 10, commercial purse seine vessels and crews were contracted to set on herring schools of known surface area to enlarge an existing data base on surface area-biomass conversion factors. Finally, additional information pertinent to stock assessment was obtained through monitoring magnitude, timing, location and composition of commercial harvests of both herring and herring spawn-on-kelp.

To enable comparison between years and between dates and areas within years, the aerial observations of fish school numbers and sizes have been converted to relative abundance indices (RAI's) following the

standard method of previous years. Each observed school was converted to an equivalent number of small fish schools of standard area (50 m^2) which then allowed summation of daily counts by index area.

TOGIAK DISTRICT (BRISTOL BAY)

Aerial Surveys

During the 1980 season survey flights in the Togiak District occurred on 22 days from April 15 through June 2. Two biologists experienced in aerial survey techniques of herring biomass assessment in the Bering Sea participated in most of these flights, frequently in the same aircraft at the same time. Suitability of survey conditions (visibility of fish schools) was rated on a 5-way scale from excellent to unacceptable for each flight and index area.

An examination of survey rating data indicated that visibility of fish schools was as good as or even somewhat better than that of the previous two years. Visibility was rated unacceptable for 14% of the index area surveys in 1980 as compared to 23% and 24% in 1978 and 1979, respectively. Survey conditions were rated poor or unacceptable in all index areas on May 11 and 13 resulting from intense storm activity on May 9, 10, and 12, but conditions improved to fair in four of the five index areas flown on May 14 and fair or good in four of six areas surveyed on May 19. It is unlikely that large numbers of herring schools were present in the Togiak District but not counted.

Test Fishing

Test fishing began May 3 and continued through May 29, nearly 3 weeks after the commercial fishery was closed. A total of 82 sets was made using variable mesh gillnets in the Nushagak, Kulukak, Nunavachak and Togiak Bay portions of the Togiak District. Duration of the sets varied from 10 minutes to 18 hours depending upon the time necessary to capture a sample of fish.

Herring composed 96% of the schooling, pelagic fishes which were likely to be spotted by aerial observers. Capelin, which are also abundant some years in the Togiak District, were not caught in the test nets until May 19 and then in very low numbers. The test net (and commercial catches) support the assumption that the vast majority of fish schools observed were composed of herring.

Relative Abundance and Timing

No fish schools were observed at the time of the scheduled fishery opening on April 15 and the first commercial herring delivery did not occur until April 25. Fish schools were observed in the Nushagak, Kulukak and Nunavachak index areas on April 28 and on all subsequent flights except those on May 11 and 13.

Herring reached peak abundance in 1980 during the period May 3-6. However on May 8, with good to excellent visibility, only about 40% of

the peak abundance was observed. Further, spawn deposition at that time, based on aerial and ground surveys and spawn-on-kelp harvest monitoring, was light and limited in extent. These factors contributed to the closure of the herring fishery by emergency order effective 6:30 AM on May 10. As described earlier, the storm of May 9, 10, and 12 reduced survey effectiveness from May 9-13. However, later surveys under improved conditions indicated a nearly constant, low level of herring abundance. The final survey was flown on June 7.

Compared to the 1978 and 1979 runs, the herring run in 1980 initially developed more rapidly, but relative abundance at the peak fell far below either of those years in nearly all index areas. The highest combined RAI for any single date in 1980 was about 10% of that in 1979 and about 30% of that in 1978. The 1980 run was largely over by May 10 which was the date of peak abundance in 1979 and the very beginning of the run in 1978.

Herring spawn deposition in the Togiak area has been estimated during aerial observations during 1978, 1979, and 1980. The 41.2 miles of spawn observed in 1978 and 21.9 miles of spawn observed in 1979 resulted in medium to heavy spawn depositions. The 23.1 miles of spawn observed in 1980 resulted in very light spawn deposition. Ground surveys documented very light spawn deposition (1 to 2 egg layers) primarily on rockweed. These findings were further substantiated by the processors evaluations of commercial spawn-on-kelp quality (fair to poor product; 1 to 3 egg layers). It was also likely that the May 9 to 12 storm destroyed a substantial amount of the season's herring spawn (9.3 miles or 40% of total).

In-Season Biomass Estimation

As the commercial fishery progressed during the 1980 season, biomass estimates were calculated from the results of each aerial survey. Surface area-biomass conversion data were available from only 3 sets in 1978 and 1979 (Table 1). A range of conversion factors was applied to the RAI's in each index area based on crude water depth data. For example a factor of 1-2 mt/RAI was applied in the shallow Togiak Bay index area while a factor of 6.7-11 mt/RAI was used in deeper Nunavachak index area. Adjustments to the biomass estimates for the abundance of other schooling fishes were not made in-season because the data could not be analyzed rapidly, but it was recognized that very few capelin were being taken in test fish or commercial nets.

The in-season calculated biomass estimate for the May 6 peak aerial survey of the Togiak District was 45,000-95,000 mt. Through that date the run was building rapidly in spite of substantial daily harvest removals, and the fishery managers judged that roughly 100,000 mt of herring were present on May 6. Thus the reported harvest of about 18,500 mt through May 8 was well within the 10-20% exploitation rate goal. The biomass estimate based on the May 8 survey fell to 11,800 - 23,300 mt.

Post-Season Biomass Estimation

After fishing was closed on May 10, contracted purse seiners provided tonnage data on 6 additional schools of estimated surface area in the

Togiak District in 1980. Thus, there are 9 data pairs from the 1978-80 period (Table 1). Before these data were analyzed it was assumed that density of herring schools as perceived from the air would increase with water depth. For example, a school of 50 m^2 surface area in 20 meters of water was assumed to have a biomass twice as great as the same sized school in 10 meters of water. However, the school density estimates to date neither support nor refute that assumption and bathymetry information is incomplete. Therefore a simple arithmetic average of the 9 data points of 3.4 mt/RAI was chosen for post-season estimation of herring biomass in 1980. Relative abundance indices from aerial surveys on May 6, 19 and 20 were used as the basis of calculations of total 1980 season herring biomass. Herring present on May 6 were about 93% 6, 7 and 8 year old fish, whereas those present on May 19 and 20 were about 60% 3 and 4 year old fish. It was necessary to utilize RAI's from both May 19 and May 20 to obtain good surveys of all index areas at that point in the run.

In 1980, the combined RAI for the three dates for all index areas in the Togiak District was 15,249 (Table 2). Applying the 3.4 mt/RAI conversion factor yields an estimated biomass of pelagic schooling fishes of 51,846 mt. Of those, 4% or 2,074 mt were species other than herring based on the results of test fishing, which leads to an estimated herring biomass of 49,772 mt. The commercial fishery removals (12,508 mt) 1/ prior to the May 6 peak aerial survey must be added, which yields an

1/ Includes preliminary commercial catch plus prorated wastage prior to May 6.

estimated herring biomass for the Togiak District in 1980 of 62,280 mt or about 62,300 mt (Table 2).

Age Composition

Age composition of Togiak District herring during the 1979 and 1980 spawning seasons have only recently been analyzed in detail. Age composition estimates from both commercial purse seine and variable-mesh test gillnets show the 1973 and 1974 year classes of herring to have been relatively strong (Figure 2). Those two year classes combined represented 80 percent of the herring population in the Togiak District during 1979 and 1980. The 1970-72 and 1975-77 year classes were much weaker, and together represented only 20 percent of the herring present.

Temporal differences in age composition were found in both years. Older herring returned inshore during the early and middle weeks of the run, while younger herring arrived during the latter weeks. Age compositions of herring from the Kulukak, Nunavachak, Togiak, and Hagemeister sections were similar for any given time period, whereas the age composition of samples from the Nushagak Peninsula area differed.

Estimation of herring biomass in districts north of Bristol Bay was more difficult due to fewer surveys flown during the season and the higher frequency of poor weather and turbid water conditions. Also the surface area-biomass conversion factors were derived from observations in the Togiak District and thus may not be representative of these northern stocks. For these reasons biomass estimates for districts north of Cape Newenham can be regarded as less accurate than for the Togiak District. However comparative RAI data presented in Table 2 is believed to fairly accurately depict the relative abundance of these northern stocks from year to year.

Unacceptable survey conditions precluded aerial assessment of herring abundance in Goodnews Bay, Nelson Island and Cape Romanzof areas during 1980. Biomass estimates in these areas were based largely on current year subsistence or test fishing data in combination with 1978-79 biomass data. Biomass estimates were made for Security Cove and Norton Sound in 1980 using techniques previously described for Togiak.

Several attempts were made to survey herring stocks north of Norton Sound. There is growing evidence from test fishing and subsistence catches during fall, winter and early spring that these stocks remain in inshore waters year-round and do not join other Bering Sea herring stocks wintering north of the Pribilof Islands.

Security Cove District

Aerial surveys were flown in this District on 13 days from May 2 through June 7 during the 1980 season, about triple the effort of the previous year. Twelve of the surveys were made under fair to excellent conditions. Fish schools were observed on all of the flights, however the peak relative abundance (RAI) of 407 of May 22 was only 14% of the peak abundance of the previous year. Only one light cloud of milt was seen in Security Cove proper on May 13, although additional spawning was noted west of Security Cove on June 7.

For management purposes during the 1980 season, a surface area-biomass conversion factor of 6.7 per standard school was applied to the season peak RAI of May 22. No adjustment was made for the presence of other species. The biomass estimate used in-season was 2,727 mt.

Test fishing with variable mesh gillnets was conducted from May 12 through June 3. A total of 33 sets captured 5303 pelagic schooling fishes of which only 23% were herring. It appears that the limited area in which test fishing occurred may have been favored by capelin, which contributed the majority of the schooling fish. Therefore in the post-season estimation of herring biomass, 75% of the total fish school area and biomass was assumed to have been herring. The same proportion was used in 1978.

In the post-season estimation of 1980 herring biomass for Security Cove, abundance indices (RAI's) for May 18 and 26 were summed resulting in an RAI of 435 (Table 2). Herring from test fish samples prior to May 18 were about 85% age 6 or older while herring taken after May 25 were about 77% age 3 or 4. Applying the surface area-biomass conversion of 3.4 mt/RAI to the RAI of 435 resulted in a fish biomass of 1479 mt. Assuming that 75% of that biomass was herring and adding commercial fishery removals prior to May 18 of 34 mt, the estimated biomass of herring in Security Cove in 1980 was 1143 mt or about 1100 mt (Table 2).

Age composition of variable-mesh gillnet samples obtained during 1980 showed that the 1973, 1974 and 1977 year classes together accounted for approximately 75% of the herring biomass (Figure 2). The 1974 year class was the strongest of the three. The 1971, 1972, 1975 and 1976 year classes were relatively weak and together accounted for the remaining 25% of the herring biomass. The sampling of herring for age analysis at Security Cove was very limited for the first 11 days of the run, which probably resulted in an underestimate of the strength of the older age fish.

Goodnews Bay

Aerial surveys in this District in 1980 were severely restricted by weather and turbidity. One survey on May 8 under fair to poor conditions resulted in a relative abundance index of 240. A second survey

on May 16 under excellent conditions indicated no fish schools present. Those two surveys generate a minimum biomass estimate of schooling fishes of 816 mt. However, it was assumed that herring populations in Goodnews Bay fluctuated in a similar manner to those of adjacent Security Cove, which experienced an 85% decrease from 1979 to 1980. Following that assumption, 15% of the midpoint of the 1979 biomass range (7,550 mt) is 1,132 mt or about 1,100 mt (Table 2).

Age composition of 1980 commercial gillnet catch samples from Goodnews Bay were very similar to commercial gillnet samples from Security Cove. Therefore the age composition of herring populations from these two adjacent spawning grounds were believed to have been very similar i.e., the 1974 year class was dominant in 1980.

Nelson Island

Aerial survey conditions were unacceptable for this area during 1980. Subsistence catch data indicate that herring abundance was similar to or slightly greater than than of 1979. The best estimate of 1980 herring biomass is then about 5,400 mt, which is the low end of the range of estimated biomass for 1979 (5,421 - 8,900 mt).

Cape Romanzof

In this District, as in the Goodnews Bay District, aerial survey data were inadequate for biomass estimation. Test fishing and spawn deposition studies indicated that the 1980 herring abundance was at least equal to 1979. The best estimate of biomass is 2700 mt which is the low end of the biomass range of 2700-4400 mt indicated for 1978 and 1979.

Analysis of age composition of 1980 variable mesh gillnet samples from Cape Romanzof showed that four year classes contributed substantially to the spawning population (Figure 2). The 1972, 1974, 1976 and 1977 year classes accounted for 89% of the 1980 biomass. The 1971, 1973 and 1975 year classes were relatively weak and accounted for the remaining 11% of the 1980 biomass. The abundance of the 1972 year class (8 year old fish in 1980) in this population is probably due in part to the absence of a commercial fishery in prior years at Cape Romanzof.

Norton Sound

Aerial Surveys of at least portions of this extended coastline were made on 12 different days from May 8 to June 26. Although fish schools were observed on all of the surveys, visibility was reduced very frequently due to weather and turbid seas. Survey conditions in 1980 were undoubtedly worse than 1978 or 1979. For example 47% of the index area surveys were flown under poor or unacceptable conditions compared to 15% and 20% under those conditions in 1978 and 1979 respectively.

Test fishing with variable mesh gillnets was conducted near Cape Denbigh from May 23 through June 9. Twenty-eight sets captured 4,275 pelagic schooling fishes, of which 99% were herring. Based on test fishing data, the biomass of other pelagic schooling fishes can be ignored.

Biomass estimates for 1980 represent minimum figures due to limited aerial survey results. The in-season biomass estimate of 9220 mt was calculated using peak RAI's by index area and a surface area-biomass conversion factor of 5 mt/RAI. The 1980 post-season herring biomass estimate for Norton Sound was calculated as the product of the combined index area RAI of 2,242 and the surface area-biomass conversion factor of 3.4 mt/RAI. That product is 7,623 mt or about 7,600 mt (Table 2).

The 1980 Norton Sound herring population was composed primarily of three year classes based on variable-mesh gillnet sampling at Cape Denbigh (Figure 2). The 1974, 1976, and 1977 year classes accounted for 88% of the biomass. Nearly 60% of the commercial catch by weight came from the 1974 year class. The 1971-1973 and 1975 year classes were much weaker and together accounted for 12% of the 1980 biomass.

SUBSISTENCE FISHERY

Villages south of the Yukon River are generally more dependent upon the subsistence fishery for herring than villages to the north. This is probably due to the greater availability of alternate food sources and lower abundance of herring north of the Yukon River.

Results of surveys made during 1975-1978 show that annual subsistence harvests for the eastern Bering Sea averaged approximately 100 mt. Villagers in the Nelson Island area, primarily at Tanunak, Toksook Bay and Umkumiut (Nightmute) accounted for about 75% of the total annual harvest. In 1980 a total harvest of 88.9 mt was recorded for the three Nelson Island villages (Table 3). In general most fishermen surveyed reported adequate numbers of herring but inclement weather limited effort in some locations.

In addition four other villages in the Yukon-Kuskokwim delta (Scammon Bay, Hooper Bay, Chevak and Kwigillingok) were surveyed and a total harvest of 21.3 mt by 80 families was recorded. Subsistence fishing effort and participation were probably decreased from previous years for some of these villages as several persons went commercial fishing for the first time in the Cape Romanzof district.

Customarily not all fishermen can be contacted during the annual surveys, which means that the resultant catches represent minimum figures. Survey results are thought to accurately reflect harvest trends.

COMMERCIAL FISHERY

Togiak District

1980 Herring Fishery

A total of 17,774 mt of herring were harvested in the Togiak District during 1980 (Table 4). The purse seine catch totaled 14,967 mt or 84 percent of the total harvest. The gillnet fleet accounted for 2,807 mt or 16 percent of the total harvest as compared to 40 percent in 1979. From 1967-1979, in years when both gears fished the Togiak District, gillnets have taken 25% of the harvest. Most of the harvest (15,052 mt or 85 percent) was categorized as sac roe herring. The remaining harvest of 2,722 mt was purchased for either the food or bait markets.

Effort levels were roughly equal to the record levels observed during 1979. A total of 140 purse seine and 363 gillnet vessels were estimated to be present during 1980 as compared to 175 and 350 respectively during 1979. A total of 34 processing companies were present during 1980 of which 27 actually purchased herring. This closely matched the 1979 season when 33 companies were present.

While the 1980 harvest was roughly double the volume of the 1979 harvest, the overall ex-vessel value of the 1980 harvest totaled only $3,200,000 as compared to $6,700,000 in 1979. An average of $50/ton was

paid for food or bait herring. A sliding scale price for sac roe herring was used based on $200/ton for 10 percent roe recovery. Roe recovery for sac roe herring was variable, ranging from 8-11 percent.

Waste of herring was a major problem during the 1980 season. In-season, it was estimated that 2,500 tons of herring were lost as a result of dumping and accidents in the fishery. A post-season questionnaire was mailed to all gill netters, purse seiners, kelpers, and processors and the results of this survey indicate that over 5,200 mt of herring were lost. In addition to the estimated loss, the participants also gave their reasons for dumping and suggestions of how this situation could be avoided in the future. Reasons for the loss included: (1) unsalable fish due to poor roe recovery; (2) lack of adequate markets to handle the capacity of the fishing fleet; (3) lack of shallow draft tenders; (4) weather related problems; (5) inexperience on the part of fishermen, processors, and spotters. Suggestions from the questionnaire respondents of how to eliminate waste in the future included: (1) require all vessels to have a market prior to fishing; (2) require the industry to purchase all herring regardless of roe recovery; (3) impose limited entry immediately; (4) sampling and test fishing to improve roe recovery; and (5) declare open and closed periods to allow a more orderly fishery.

The Togiak District remained open to the harvest of adult herring through 6:30 AM May 10. On May 8, under good to excellent survey conditions, the visible biomass of herring in the Togiak District was only about 40

percent of the May 3-6 peak abundance. The drastic reduction in the abundance of herring, a growing concern about waste, and the high rate of exploitation prompted the emergency order closure of the fishery effective May 10. The fishery was not re-opened due to the low abundance of herring observed during the remainder of the run.

1980 Spawn-on-Kelp Fishery

A total of 189,700 lbs. (86 mt) of spawn-on-kelp were harvested in the Togiak District during 1980 (Table 4). Most of the harvest (143,600 lbs. or 76 percent of the total harvest) took place in area K-10 (inner Togiak Bay). The quality of the entire harvest was categorized as fair to poor (1 to 3 egg layers). The average price paid per pound was $0.50 and ranged down to $0.30. The kelp harvested again consisted entirely of rockweed.

The entire Togiak District coastline remained open to the harvest of spawn-on-kelp through May 8. On May 9, area K-10 was closed by emergency order. Since this area had no previous harvest quota, an in-season assessment was made and a harvest quota was established at 120,000 lbs. On May 13, the entire Togiak District was closed to the harvest of spawn-on-kelp, primarily due to the scarcity of spawn as compared to past years.

The 1980 harvest of spawn-on-kelp was the smallest since 1976 and only 76% of the 1974-1980 average of 248,900 lbs. The low harvest in 1980 is

attributed to a lack of adequate spawn that precluded even the 10 percent exploitation rate (maximum allowable harvest of 934,000 lbs) allowed for in the management plan.

A total of 21 processing companies registered to take spawn-on-kelp during 1980. Only 5 companies actually received deliveries and 1 company accounted for 71 percent of the total harvest. Most of the remaining 16 companies represented small operations. The number of processors has steadily increased since 1976.

A total of 73 fishermen made 186 deliveries during the 1980 season. Due to the lack of spawn and the blanket kelp closure, a significant number of other fishermen were present but unable to participate.

Ground surveys conducted during 1980 showed severe declines in the abundance of intertidal Fucus; both in areas where there were significant harvests and in areas sustaining little or no harvest. It had previously been assumed that intertidal Fucus populations remain fairly stable when not over-harvested (i.e., biomass estimates could be extrapolated to the following year). While this may still generally prove to be true, the results of this analysis show that there will be some unpredicted declines.

1981 Management Strategies

It is the Department's assessment that an even more conservative approach is needed to manage the herring and herring spawn-on-kelp harvests in

the Togiak District. During the short history of this fishery, the Department's management strategy has been based on an expected high abundance of herring, an open season, and regulatory closures when necessary to accomplish the Board of Fisheries policy of harvesting 10-20% of the available biomass. The high abundance of herring during the period 1977-1979 allowed for nearly unrestricted fishing time. However in 1980, it was necessary for the first time to enforce a long-term conservation closure of the Togiak fishery.

Based on the apparent decline in herring biomass and year class failures in the younger age herring, a more conservative approach is needed to insure that the harvestable surplus is not exceeded until the current declining trend is reversed and a more reliable data base is available. The Department is particularly concerned about the historical example of other herring fisheries throughout the world where heavy fishing on young or weak age classes resulted in eventual failure of the stocks.

Management of the Togiak herring and herring spawn-on-kelp harvests will require more frequent exercise of emergency order authority. Under this plan, no harvest would be allowed until the Department had determined that a harvestable surplus of herring was present. The length and occurrence of fishing periods would be adjusted according to the observed biomass of herring, desired level of harvest, and level of fishing effort. If the previously observed high levels of fishing effort and processing capacity persist, it is very likely that the harvest would be accomplished through a series of short (12 hr or less) fishing periods with intermittent closures to re-assess the resource. The primary

effect of this strategy should be to provide protection for schooling herring that will allow a more normal onshore migration and commencement of undisturbed spawning. This strategy should allow resource managers the necessary time to determine the nature (i.e., strong stocks, declining stocks, etc.) of the return and effectively control the harvest. Also, waste, such as witnessed during the 1980 fishery, should be minimized by a more tightly controlled fishery.

Criteria for establishing open periods should be based on several factors. First, it is the Department's intention that no harvest be allowed during 1981 unless there is a reversal or cessation of the decline of the stocks. It is believed that if the 1981 outlook proves correct, then further exploitation on these declining stocks would have a long-term detrimental effect on future returns. Therefore, no commercial fishing will be allowed during 1981 unless a level of abundance is observed that is at least equal to that observed during 1980. It is felt that a point estimate of 40,000 mt would be indicative of the level of abundance observed during 1980. This figure represents the approximate peak level of abundance during early May 1980 when older aged herring were most abundant. Observation of this level of biomass during a 1 or 2 day period would most likely represent a spawning biomass at least equal to that observed during 1980. This threshold biomass also represents the approximate minimum level at which a 10% exploitation might be obtained with the fishing effort of the last two years. If this criterion is met, then a fishery allowing 10-20 percent exploitation would be allowed. Also at this time, a spawn-on-kelp harvest allowing 10-20 percent exploitation of the available kelp biomass would be allowed

in those areas that have received adequate spawn. It should be noted that little or no harvest will be allowed on those kelp beds that exhibited a significant decline in biomass.

Second, a more conservative strategy should be applied to younger age fish. It is probable that age 3 (and possibly age 4) herring are at the stage in their life cycle where growth and recruitment essentially balance mortality and have therefore achieved their peak biomass. A fishery targeted on low or intermediate levels of abundance of these younger age classes could have a severe impact on their abundance ~~at~~ in subsequent fishing seasons ~~older ages~~. Therefore, the Department feels that little or no commercial fishing should be allowed during the later stages of the migration where younger (age 3 and 4) fish predominate unless we are confident that these fish represent a strong year class (i.e., analogous to the 1973 and 1974 year classes). It is again felt that a second and distinct threshold level of 40,000 mt is needed to justify even a minimal harvest of age 3-4 herring. At levels of abundance beyond this threshold level, the Department would allow a maximum of 10 percent exploitation with a very strong return. Further spawn-on-kelp harvest could also be allowed at this time.

In order to determine the strength of the various components of the herring run, the Department will continue to maintain intensive on-the-grounds surveillance throughout the duration of the migration. Special emphasis will be given to key programs: (1) aerial surveys to determine abundance using the density conversion factor of 3.4; (2) test fishing

to determine age composition; and (3) ground surveys to determine kelp abundance and spawn depositon. The Department has also initiated a long-term study with the University of Alaska to study the biology of Fucus sp. and its importance to the success of herring spawnings. It is hoped that this kind of study will provide the necessary answers to more effectively manage this resource.

Additional purse seine sets to gather info?

Arctic-Yukon-Kuskokwim Districts

A total of 3,807 mt of herring was landed in districts located north of Togiak in 1980. The 1979 harvest in these districts totalled only 1,639 mt (Table 4).

Thirteen different processors registered and purchased fish in these districts. With the exception of one shore based plant in Norton Sound that air transported whole herring, all were floating processors. Several of the floating processors operated in two or more districts. Ship-board processing varied from freezing or brining in the round to stripping sac roe on the fishing grounds and freezing or brining the carcasses. Several processors off-loaded frozen herring directly to a Japanese tramper on the fishing grounds.

Prices ranged from $200-$400 a short ton for 10% roe recovery with ± $20 for each point above or below 10%. Later in the season several buyers in the Security Cove and Goodnews Bay districts raised prices to $400 a ton for 10% roe and ± $40 a point. The price for bait herring

(low roe recovery) was generally $50 a short ton. Fishermen earned approximately $880,000 for their 1980 catch.

A few fishermen were known to dump herring due to poor roe recovery and there also was an unknown quantity of "drop-outs" from gillnets. One processor was observed discarding spawnouts and this information was turned over to Division of Fish and Wildlife Protection personnel. Generally, wastage was regarded as minimal compared to the Togiak fishery due to the slower pace of the gillnet fishery and the presence of one or more buyers in each district that would purchase the lower quality herring for bait.

The timeliness and accuracy of catch reporting this season improved considerably over 1979 largely the result of the presence of the MV Resolution in the Security Cove and Norton Sound districts. This vessel served as a communications center and allowed Department personnel to periodically board processor vessels to collect fish tickets and sample commercial catches for biological information.

Security Cove District

A total of 632 mt (89% sac roe, 11% bait) was landed by 175 fishermen. Roe recovery for the season averaged 8.2%. Although the season opened on May 1, the first deliveries were not made until May 14 when the first buyer arrived. Department studies indicated that herring had been present in the district since May 2 and also some spawning had occurred

prior to fishing. An estimated 47 fishermen (27% of the total) were local residents of the Kuskokwim Bay drainage including Bethel and they landed only 10% of the harvest.

It is difficult to estimate the actual number of fishing boats that were operated. New fishing boats were arriving over a period of several days and several boats made only one or two deliveries before departing. It is estimated that 110-120 boats were present and most of these had previously participated in the Togiak fishery. This estimate includes about 20-30 "local" boats, most of which were from the Bethel area. Many boats contained three or four persons, all of whom possessed interim use permits, and would take turns in using the permit cards for deliveries or split up one delivery between several permit cards. This situation was fairly common in the other herring fisheries as well.

Due to a decrease in herring abundance and an increase in fishing effort compared to last year, periodic season closures were required in attempting to maintain the harvest within acceptable biological limits. Due to a substantial decline in herring abundance observed on May 16, the season was closed from 6:00 P.M. May 17 until 12 Noon May 19. Another closure occurred during May 24-27. A final 24 hour fishing period was authorized during May 27-28, but by this time only limited processing and fishing effort was available.

Goodnews Bay District

A total of 407 mt (93% sac roe 7% bait) was landed by 165 fishermen. Roe recovery for the season averaged 9.5%. The season was opened by emergency order on May 15 and continuous fishing occurred from May 18 through May 24 when the season was closed. An estimated 135 local fishermen (82% of total) took 75% of the total harvest.

Accurate biomass estimates could not be made due to turbid waters. It was decided to close the season on May 24 since the guideline harvest level had been exceeded and it was known that herring abundance had declined in the immediately adjacent Security Cove District.

A number of the larger gillnet boats were fished in this district during the May 18-19 closure of the Security Cove district, but for the remainder of the season a majority of the effort was by local boats. An accurate estimate of the total number of boats operated is not available, but a total of 44 boats were observed fishing during a May 22 aerial survey.

Cape Romanzof District

A total of 554 mt (98% sac roe 2% bait) was landed which marked the first time this district had been fished commercially. Processing and tender vessels belonging to the two buyers were anchored just inside Kokechik Bay near Aniktun Island. Average roe recovery for the season was 9.8%.

A total of 69 fishermen made at least one delivery during the season and operated out of 54 boats. Seventy and 78% of the fishermen and boats respectively were from the local area, primarily Hooper Bay, Scammon Bay and Chevak. It is estimated that about 40% of the harvest was made by local fishermen.

The commercial fishing season officially opened April 15 but fishing did not begin until May 21 when the first processor arrived. By May 26 a cumulative catch of 393 mt had been taken and a temporary season closure was made from May 26-30 to allow further evaluation of stock condition and abundance. Additional spawning and good test fishing catches of maturing herring were documented during the closure and the season was reopened 12 Noon May 30. Fishing effort during the "second season" was hampered by severe storms that lasted for several days. Only one buyer and local fishermen were present during the second season when 161 mt was taken.

Norton Sound District

The 1980 herring season opened by regulation on April 15, but the first commercial delivery was not made until May 21. The season was closed on June 6 and resulted in a harvest of 2,215.4 mt (Table 4). Ninety-nine percent of the herring was used for sac roe, with the remainder being processed for bait. Gillnets accounted for 98.5% of the harvest, with beach seines taking the remainder. The average percentage of roe recovery for sac roe herring was 8.1%. Last year's harvest totaled 1,172 mt.

There were approximately 294 fishermen who made at least one delivery in Norton Sound. Of these, 67% were residents of the Norton Sound area. The remaining 33% were gillnet fishermen who accompanied processors or tenders who came into Norton Sound from herring fisheries located in the south. Local fishermen landed approximately 55% of the total harvest.

Fishing effort was initially concentrated in the area between Unalakleet and Cape Denbigh and by June 2 a total of 1,147 mt had been taken in this area. This area (actually from Tolstoi Point to Ungalik River) was closed by emergency order on June 2 to prevent possible overharvest of specific stocks and to distribute the effort to other portions of the district.

After this closure, effort shifted to the area between Tolstoi Point and Stuart Island. This area was closed by emergency order on June 4 after 1,057 mt had been harvested which was approximately 20% of the in-season estimate of biomass in this area.

At this point, most of the processors decided to stop buying and left Norton Sound. Two processors did continue buying, going to the Golovin Bay area. After taking 6.4 mt of herring, which had low roe recovery and high incidence of spawnouts, the remaining waters of Norton Sound were closed on June 6.

There was one company which bought spawn on kelp. Between June 9 and 12, 22.2 mt of spawn on kelp was harvested by twenty fishermen. The

harvest occurred from Klikitarik to St. Michael and was fairly well dispersed between these two areas. This fishery terminated when the company voluntarily quit buying on June 12. The price paid was between $1.30 and $1.50 per pound. Total value of the spawn on kelp harvest to the fishermen was approximately $73,000. In 1979, 19 fishermen harvested 11.8 mt of spawn on kelp worth approximately $15,600 to the fishermen.

Wastage of herring did occur in Norton Sound, but was judged to not be a major problem. There was a major storm that lasted two days, May 31 through June 1. Some nets were lost or were washed up on the beach and many herring in these nets were not salvageable.

1981 Management Strategies

Similar to the Togiak district, a more conservative management strategy is planned for the 1981 season due to stock declines in some districts and expected increases in fishing effort in all districts. Management of the Togiak fishery will greatly influence participation in these northern districts, especially Security Cove and Goodnews Bay districts.

The staff is proposing that the fishing seasons and periods be opened and closed by emergency order in the Security Cove and Goodnews Bay districts. The number and duration of fishing periods will be dependent on herring abundance and fishing effort. Minimum in-season biomass estimates required for opening the season in each of these districts

will be 800-1000 mt. This strategy will insure opening of the season when the 1981 abundance is similar or slightly greater than in 1980. Also it would be extremely difficult to manage for such a small harvest at lower biomass levels. Unless substantial increases in population levels occur, the 1981 harvests in these districts can be expected to be smaller than in 1980.

Advantages of delaying the season opening and providing periodic open/-closed fishing periods include: (1) allows normal herring migrations and spawning for portions of the season, (2) affords additional time in assessing stock abundance and condition to insure that proper harvest levels are maintained, (3) slows the pace of the fishery to minimize processing gluts and wastage.

Stock conditions in the Cape Romanzof and Norton Sound districts based on 1980 data, appear more favorable than in districts located to the south. Major changes in management strategies for these districts are not anticipated. However fishing effort is expected to increase and it is likely that periodic season closures will be required to maintain proper harvest levels. The 1981 harvests are expected to be similar or slightly larger than in 1980.

Attempts will be made to maintain in-season exploitation rates of 10-20%. The lower end of this range will be applied to stocks that are exhibiting trends of decreasing abundance or poor recruitment. The upper end of this range will be applied to the management of stocks in good condition (larger volume, increasing abundance, good recruitment).

The lower end of the range will generally be applied early in the season and can be adjusted accordingly later in the season as additional information is obtained on stock condition. The lower school density conversion factor of 3.4 will be used for estimating biomass in all districts unless new information becomes available during the 1981 season. An exception is the 2.4 density conversion figure for the extremely shallow Goodnews Bay district.

A major limitation of the biomass estimates in these northern districts is that density conversion data are derived from studies conducted in Togiak. Barring weather and water conditions, funding is available for expansion of aerial surveys. Also attempts will be made to obtain school density information in one or more districts employing ~~similar~~ methods ~~studies~~ used in Togiak.

If it is not possible to determine biomass from aerial surveys, then management will have to rely on relative herring abundance and other biological information. Examples of this information include catch rates, age composition, ratios of pre to post spawners from test net and/or commercial catches. Test fishing studies will be expanded in most districts to determine age composition and sexual maturity (including spawnouts) of herring and the incidence of other pelagic species. Studies to measure spawn deposition will be improved to provide a better measure of herring abundance in districts having turbid waters (e.g., Cape Romanzof).

The Legislature adopted a law that allows disposal of carcasses in the Bering Sea during the 1981 season. The law also directs the Board to adopt regulations to minimize possible environmental damage resulting from carcass disposal. It is recommended that carcass disposal be prohibited in nearshore waters adjacent to spawning grounds (e.g., within one mile of coastline) and in certain bays characterized by shallow depths and restricted circulation (e.g., Goodnews Bay, upper Golovin Bay).

SUMMARY-CONCLUSIONS

The domestic commercial herring fishery, virtually nonexistant four years ago, was fully exploited during the 1980 season. This marks the first time that herring in every district from Togiak to Norton Sound were commercially harvested. The total Bering Sea domestic commercial harvest was 21,582 mt (excluding an estimated 5,200 mt wastage in Togiak) compared to 7,303 mt and 11,754 mt in 1978 and 1979 respectively.

In all districts which produced reliable aerial biomass estimates, the in-season exploitation rates approached or exceeded 20%. Department managers, following Board of Fisheries guidelines to maintain the exploitation rate between 10-20%, consequently closed the seasons in each of the districts from Togiak to Norton Sound by emergency order. A surface area-biomass conversion factor was used to calculate final (post-season) estimates, which resulted in lower biomass estimates in all districts. Thus exploitation rates were greater than those determined from in-season biomass estimates and ranged up to 57% for Security Cove. The exploitation rate for the Togiak fishery was 37%, including both commercial harvest and an updated estimate of wastage (5,200 mt).

Based largely on aerial survey estimates, the abundance of herring in 1980 declined substantially in the Togiak, Security Cove and Goodnews Bay districts where a majority of the eastern Bering Sea spawning biomass occurs. Accurate biomass estimates are not available for the

relatively small populations located in the Nelson Island - Cape Romanzof area, but herring abundance in this area was probably similar to 1979 levels. Herring abundance in the Norton Sound district exhibited a moderate increase in 1980 based on aerial survey data, but not so much as to offset the reductions in the southern populations.

Total estimated spawning biomass for districts between the Nushagak Peninsula and Cape Douglas (north of Nome) was 80,200 mt in 1980 compared to 137,000 mt in 1978 and 253,100 mt in 1979.

An important difference between the 1980 Togiak, Cape Romanzof and Norton Sound spawning populations was the greater relative abundance of younger fish (1978 and 1977 year classes) in the northern populations. Similar comparisons are difficult to make in the other areas due to limited sampling.

The inshore commercial fishery developed without the need of major regulatory restrictions during 1977-1979 when herring abundance was steadily increasing in most districts. Based on the observed decline in herring biomass or year class failures in the younger age herring, a more conservative management approach must be implemented during the 1981 season for the Togiak, Security Cove, and Goodnews Bay districts. The following proposed measures should help to insure that harvestable surpluses are not exceeded and recent population declines are reversed:

(1) fishing seasons and periods will be regulated by emergency order,

(2) season openings will be delayed until minimum biomass levels similar to 1980 are observed,

(3) the number and length of fishing periods will be dependent on herring abundance and fishing effort,

(4) provided that minimal biomass levels are observed, exploitation rates of 10-20% will be maintained; exploitation rates of identifiable younger aged fish will be decreased,

(5) a school density conversion factor of 3.4 will be used for estimating biomass in most districts and sub-districts.

Management strategies in the Cape Romanzof and Norton Sound districts will be similar to the aforementioned measures except that the fishing seasons will open on established dates and minimum biomass levels required to open the season have not been identified. Periodic season closures will probably be required to maintain proper harvest levels if fishing effort increases in these districts.

The Department recommends that no additional fishing prior to the 1981 spawning season be permitted on the Western Alaska herring stocks. Under State regulations, no domestic offshore fishery for food or bait herring is permitted north of 56° north latitude in the Bering Sea. The Department strongly recommends that the foreign and joint venture fisheries for herring not be permitted during the aforementioned period. It is further recommeded that Federal sanctions be imposed which would

strongly discourage covert targeting on herring. This could be accomplished by instituting a herring savings area or by continuing the classification of herring as a prohibited species, coupled with substantially increased observer and enforcement coverage.

Table 1. Conversion estimates; metric tons of fish per 50^2 meters of surface area, Togiak herring grounds, 1978-1980.

Date	Observer	Est. of tons /50^2m	School size in feet	Weight of catch in tons	Actual or est. weight of catch	Fish condition	Location of set	Water depth in feet
5/13/78	Nelson	6.7	1/	1/	Estimated	1/	Nunavachak Bay	1/
5/18/78	Nelson	11.0	80 x 60	110	Estimated	2/	Nunavachak Bay	1/
5/04/79	Randall	2.4	40 dia.	5.6	Actual	Ripe	Ungalithluk Bay	20
5/15/80	Barton/Nelson	1.22	60 x 40	6	Actual	Ripe	Ungalithluk Bay	10
5/15/80	Barton/Nelson	1.63	40 x 30	4	Estimated	Spawn-outs	Ungalithluk Bay	25
5/16/80	Barton/Nelson	1.14 2/	220 x 50	21	Actual	Spawn-outs	Nunavachak Bay	15
5/16/80	Barton/Nelson	1.17	65 x 20	3	Estimated	Fish lost	1 Mile West Ungalithluk Pt.	16
5/20/80	Barton/Nelson	2.99	70 x 70	30	Estimated	Ripe	East of Eagle Bay	20
5/20/80	Barton/Nelson	2.60	150 x 75	60	Estimated	Fish lost	Eagle Bay	20

1/ Incomplete data.
2/ Average of 2 observers estimates.

x	y
1.14	15
1.17	16
1.22	10
2.4	20
2.6	20
2.99	20

$r^2 = .83$

Table 2. Relative abundance index (RAI) and estimated biomass of eastern Bering Sea herring, 1978-1980.

District	Relative abundance index (RAI) [1] 1978	1979	1980
Togiak	43,050	137,630	15,249
Security Cove	246	2,912	435
Goodnews Bay	241	3,729	[3]
Nelson Island	1,079	[3]	[3]
Cape Romanzof	539	[3]	[3]
Norton Sound	1,277	1,360	2,242
Totals	46,432	146,131+	17,926+

District	Estimated biomass in mt [2] 1978	1979	1980
Togiak	172,600	216,800	62,300
Security Cove	1,200	19,500	1,100
Goodnews Bay	400	6,700 [3]	1,100 [3]
Nelson Island	5,400	5,400 [3]	5,400 [3]
Cape Romanzof	2,700	2,700 [3]	2,700 [3]
Norton Sound	4,800	7,000	7,600
Totals	187,100	258,100	80,200

1/ Number of fish schools equivalent to 50 m^2 surface area, unadjusted for presence of non-herring pelagic species.

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

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

Table 3. Nelson Island herring subsistence catch (in metric tons) and effort data, 1975-1980.

Area	1975	1976	1977	1978	1979	1980
Tanunak	19.8	13.9	51.9	34.6	31.0	59.2
Umkumiut	30.0	8.5	2.8	10.4	7.5	3.1
Tooksook Bay	31.0	31.8	19.3	33.5	46.5	26.6
Total Catch	80.8	61.2	74.0	78.5	85.0	88.9
Number of Fishing Families	109	42	90	83	54	70

Table 4. Herring and herring spawn on kelp harvests in metric tons by U.S. commercial fishermen in the eastern Bering Sea, 1909-1980.

Year	Herring 1/ Unalaska Island	Bristol Bay	Security Cove/ Goodnews Bay	Cape Romanzof	Norton Sound	Total	Herring spawn on kelp 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	1,730.2				399.7	2,137.9			
1931	957.9				78.2	1,036.1			
1932	2,276.9				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	60.0					60.0			
1946									
1947-1963		NO COMMERCIAL OPERATIONS REPORTED							
1964					18.1	18.1			
1965		NO COMMERCAIL 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	7,303.6	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 5/		17,774.0 4/	1,039.0	554.0	2,215.4	21,582.4	86.0	22.2	108.2

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 metric tons of wastage.
5/ Preliminary data

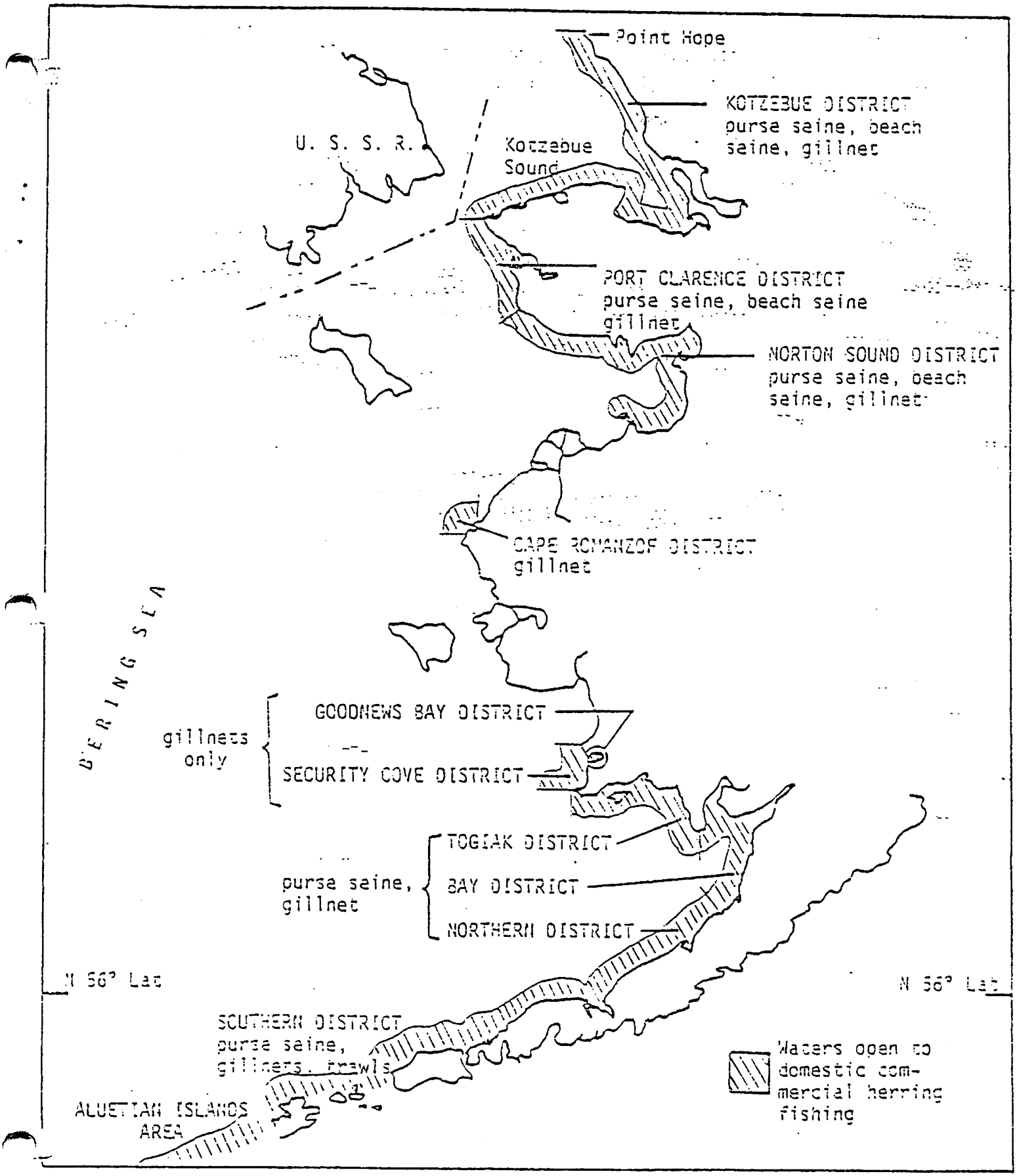

Figure 1. Areas and fishing gear applicable to domestic commercial herring fishing, Bering Sea, 1980.

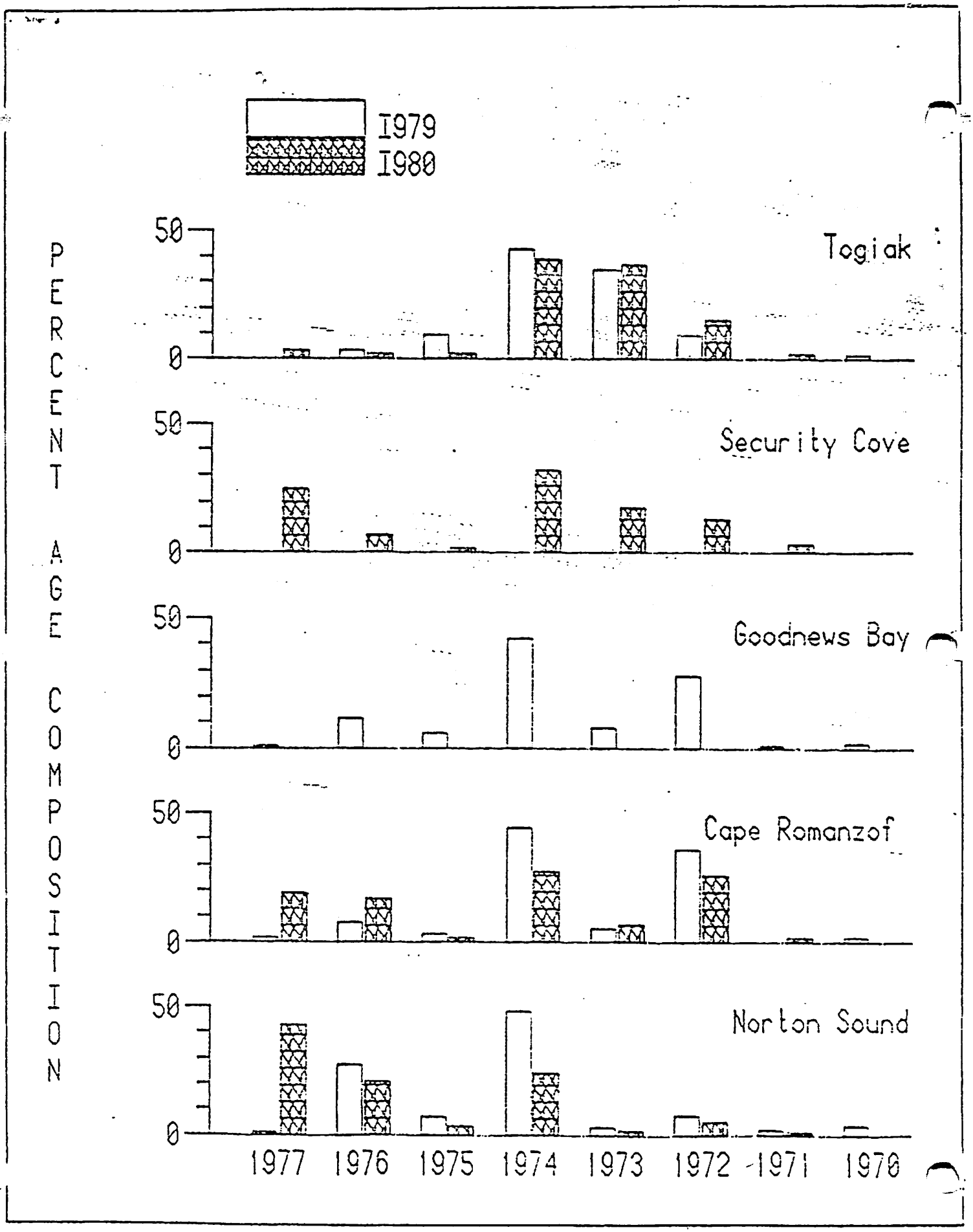

Figure 2. Year class composition of Pacific herring along selected coastal sites of commercial fishing districts, Bering Sea, 1979 and 1980 based on variable mesh gillnet sampling.

Historically, Area B has contained the bulk of the herring found on the winter grounds. However, in recent years, in response to above average hydrological conditions, herring winter distribution shifted to the northwest corner of Area C. Since herring are known to winter in different locales over a large range and since it may be difficult to determine the specific area it may be prudent to select Area C, which covers most of the winter range, as the primary area closure for the November-March period. The area would remain open until OY and AIC was attained. At the time that OY and AIC was attained the Regional Director can, by emergency order, close the entire area or only the portion of Area C necessary to protect herring in a particular season using criteria specified under Section 14.3. If it occurs that OY and AIC is exceeded prior to November or OY or AIC is so small that they could be exceeded within one reporting period (one week) and the specific wintering location of the herring population in that season cannot be determined then that portion of Area C corresponding to Area A should be closed. This closure under the above set of conditions was selected because it provides the greatest savings of herring and the least impact to the pollock fishery based on the available data.

Table 19. Methods for Determining and Allocating Optimum Yield of Bering Sea Herring

APRIL-1 SEPTEMBER	A. Determination of Preliminary OY 1. ABC a. Estimated spawning biomass from previous season x exploitation rate. 1/ b. Add 2,000 mt for estimated harvest potential of unsurveyed Alaska Peninsula-Aleutian Island stocks. c. Subtract estimated allowable incidental catch (AIC) by offshore groundfish fisheries. 2. OY: Same as for ABC except the Nelson Island stock, which is reserved for subsistence use only, is excluded from ABC estimates.	B. Allocation of Preliminary OY 1. 2,000 mt to domestic offshore bait/food fishery. - not available until July 1 south of 60° N. Lat or August 1 north of 60° N. lat. 2. Remaining OY to domestic inshore subsistence and roe fisheries. 3. Foreign offshore groundfisheries not given allocation but may harvest herring to limits of AIC.
SEPTEMBER	A. Determination of Final OY Identical to that for preliminary ABC and OY except use current season estimated spawning biomass.	
OCTOBER-MARCH		B. Allocation of Final OY 1. If surplus OY a. Surplus OY to domestic offshore food/ bait fishery to capacity. - capacity determined by intent to operate. b. Remaining surplus OY to TALFF - includes unused domestic allocations to be determined by January 30. 2. If no surplus OY: Enforce offshore winter savings area for domestic and foreign fisheries, except: a. domestic fishery allowed to harvest unused portion of 2,000 mt initial allocation. b. foreign groundfish fishery allowed to harvest unused portion of AIC.

1/ Exploitation rate varies according to stock condition and spawning biomass estimates; under normal stock conditions (240,930 mt biomass) exploitation rate is 20% (see section 9.6.2.2).