MEMORANDUM

TO: Council, AP, and SSC Members

FROM: Clarence G. Pautzke
Executive Director

DATE: April 14, 1993

SUBJECT: Groundfish Plan Amendments

ACTION REQUIRED

Initial review of the preferential and seasonal allocations of Pacific cod analysis.

BACKGROUND

At its January 1992 meeting, the Council asked staff to prepare an amendment package that included alternatives to establish fixed allocations of the Pacific cod TAC by gear. The Council's request was, in part, the result of a proposal it received from the North Pacific Fixed Gear Coalition that proposed that fixed gear operators be given preferential access to certain groundfish species in the BSAI.

Last September the Council reviewed the preliminary analysis of this proposal for allocating Pacific cod by gear types. Based in part on deficiencies that were identified in the initial draft, the AP and SSC recommended that those deficiencies be eliminated and that a revised draft be prepared. The Council accepted these recommendations, asked that the revised draft, with an analysis of alternative seasons for the cod fisheries, be available in April for the Council to decide whether to release it for public comment. The latest draft analysis was mailed to you on April 12, 1993. An executive summary of the analysis will be available by meeting time.

The analysis reviews the impacts of two types of changes. One would establish explicit allocations of the cod TAC among the trawl, longline, and pot groundfish fisheries. The other type would change the fishing season for Pacific cod from starting in January to starting in September, and/or apportion cod TAC among the following trimesters: January - May, June - August, and September - December. The fishing season can be changed with a regulatory amendment. The other changes would require an FMP amendment. The Council can consider making one, both, or neither of these two types of changes.

With respect to explicit allocations by gear, the options range from only bycatch amounts of cod for the trawl fisheries, to only bycatch amounts of cod for the longline and pot fisheries. The blend estimate of total cod catch for 1992 is 205,326 mt and the TAC was 182,000 mt. The blend estimate of cod bycatch in other trawl fisheries is 42,387 mt. This is 20.6% of the total cod catch or 23.3% of the cod TAC. The blend estimate of cod bycatch with all non-trawl gear is 355 mt. This is about 0.17% of the total cod catch or 0.20% of the cod TAC. Using these data, the range of allocations of the cod TAC to the trawl fishery would be from between 20.6% and 23.3% to over 99%.

Three processes are being considered for changing the seasonal allocation once it is established. They are: (1) an FMP amendment, (2) a regulatory amendment, and (3) a framework that could be used annually.

Currently, the analysis addresses the Pacific cod allocation proposal in a broad manner by considering many alternatives or combinations thereof. In its initial review, the Council may consider narrowing possible alternatives to more specific options. The report contains information that can be used to readily address more specific options.

The Council can review the draft amendment package (Amendment 24 to the BSAI FMP) and vote to release it for public review. If released, the Council could take final action on this amendment at the June 1993 meeting. If the Council recommends specific changes to the FMP in June and if those recommendations are approved by the Secretary, the implementing regulations probably could be in place in 1994.

AGENDA D-2(b)
APRIL 1993
Supplemental

Fishermen's Finest

North Pacific Fishing, Inc.

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April 13, 1993

Richard B. Lauber, Chairman
North Pacific Fisheries Management Council
605 West Fourth Avenue
Anchorage, AK 99501

RE: Groundfish FMP Amendments (Agenda Item D-2), Pacific Cod

Dear Chairman Lauber:

I am writing to submit our comments on the for the Council's consideration during its April 1993 meeting. Over the past two years it has become increasingly apparent that some form of increased cod management will be required to provide for the optimalization of the cod fisheries' yield. In 1992 the percentage of cod taken in the first trimester of the year increased to 68% while the amount harvested in the last trimester fell to 4%. In 1993 it appears that the first trimester harvest will be closer to 90% of the TAC. This lopsided harvest of this economically vital species in neither biologically nor economically beneficial to the nation and the need for increased management measures is indicated.

The Council has before it three basic management alternatives, of the three seasonal apportionment of cod TAC provides the least regulatory burden on individual fishermen while providing a simple and proven approach to solving the problem of lopsided supply.

Biological benefits from a seasonal apportionment of TAC include removing effort from the high halibut bycatch summer season; increased yield from fishing over periods longer than the spawning season [See Grant Thompson's Appendix H to the Cod Analysis which shows decreased stock strength over short harvest seasons compared to a nine to twelve month season (figure H1), and a decreased stock strength when the length of the catch season equals the length of the spawning season (figure H2)].

While economic considerations, such as seasonal price fluctuations, are beyond the clear vision of the council, general trends may be considered in evaluating the value of a policy change. The economic benefits to the nation of seasonal apportionment include providing a steady supply of cod to our growing domestic market which will not survive the ups and downs of sudden protracted drops in the supply of its raw material. The preservation of fledgling domestic value added processing operations is to the ultimate economic benefit of the nation. This seasonal management plan mirrors the pollock "A" and "B" season apportionments and is well

founded both in its practicality and its conformity to traditional management practice.

The other two measures include gear-type preference and early season start dates. The first of these two options is another attempt to pick a winner in an intra-industry gear type conflict; this is an inappropriate roll for government. The second alternative, early season start, should be avoided due to its complication of the scientific and regulatory management processes.

By applying the simple management formula of seasonal apportionment within the current January to December fishing year structure, we can improve the stock status and the economic yields to both fishermen and the developing U.S. cod processing industry. We can make these improvements without attempting to choose which fishermen win and loose. I recommend that the council adopt this productive and simple management program.

Sincerely,

Rudy A. Petersen

Rudy A. Petersen
President

AGENDA D-2(b)
APRIL 1993
Supplemental

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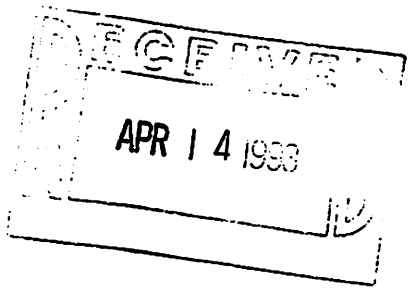
AND THE UNITED STATES OF AMERICA

April 8, 1993



Dr. Clarence Pautzke
Executive Director
NPFMC
P.O. Box 103136
Anchorage, AK 99510

Dear Clarence:

Enclosed is a copy of an analysis by Sara Adlerstein of time-area effects of bycatch in the Pacific cod trawl and longline fisheries of the Bering Sea-Aleutian Islands area. The report concludes that significant time-area differences exist for halibut bycatch rates in the groundfish fisheries and for lost yield to the halibut fisheries. Summer closures in the longline fishery and summer closures between Unimak Pass and the Pribilof Islands in the trawl fisheries would decrease bycatch rates and lost halibut yield.

We have sent a copy of the report to Joe Terry for his use in completing the analysis of Pacific cod allocation in the Bering Sea-Aleutian Islands. He probably cannot incorporate these results in the draft that will be reviewed by the Council at the April meeting. I hope that Joe and the Council will agree that the report contains valuable information that should be included before the allocation draft goes out for public review.

I will be available at the April meeting to discuss this further if necessary.

Best regards,

Bob

Robert J. Trumble
Senior Biologist

enclosure

cc. Joe Terry, AFSC

DRAFT April 1993

Spatial and temporal variation of Pacific halibut bycatch rates inflicted by the Pacific cod domestic fisheries in the Bering Sea and of losses to the halibut setline fishery

by
Sara Adlerstein, IPHC

Summary

This study investigates spatial and temporal variations of halibut bycatch aspects in the Bering Sea bottom trawl and longline Pacific cod fisheries. First, spatial and temporal analysis of halibut bycatch rates, defined as the weight of halibut caught by ton of groundfish, was performed. These rates are the basis of present bycatch management regulations. Next, the analysis estimated the effect of these bycatch rates, the net yield loss, to the halibut fishery in time and space. This analysis is necessary because if the size characteristics of the bycatch vary in time and space, the effect of these bycatch rates on the halibut fishery, on a per weight basis, is bound to change.

The bycatch rate analysis compared bycatch rates among the three digit North Pacific Fisheries Management Council statistical areas and within months, using observer fishery data. Results showed significant spatial and temporal differences in bycatch rates in both fisheries. Rates were higher between May and August than during the rest of the year, and in areas close to Unimak Pass.

The analysis of the effect of the bycatch on the halibut fishery consisted in various steps. First were estimated the yield loss per pound of bycatch inflicted to the halibut fishery, and the catch limit reductions necessary to maintain reproductive output (egg production) at the same level it would be in the absence of bycatch were estimated. Results indicate that in the longline fishery the yield loss and the reproductive compensation factors do not vary between areas nor within months. In the trawl fisheries in areas between Unimak Pass and the Pribilof Islands, both factors decrease sharply in the summer. In other areas these factors are constant. Finally, the net effect of the bycatch per ton of groundfish catch in the Pacific cod fisheries to the halibut fishery was estimated. For the most cases, higher losses coincide with higher bycatch rates during May to August. Temporal differences are greater in the longline than in the trawl fishery.

Results of the present analysis provide basis for restricting the longline fishery

during June and July across the areas of the Bering Sea included in the analysis. A restriction on trawl fishing would be appropriate between May and June, but only in areas between Unimak Pass and the Pribilof Islands. Closure during months of high net yield loss could have reduced the bycatch by area by 50 to 85% per ton of groundfish in the longline fishery, and 65 to 75% in the trawl fishery. Data available for the study was limited to a few months and areas, particularly in the trawl fishery, and the analysis should be extended to evaluate overall spatial and temporal options to reduce bycatch. Results support exploring fishery management options based on temporal-spatial closures, and including yield loss calculations when exploring those options.

Introduction

Bycatch of Pacific halibut *(Hippoglossus stenolepis)* continues to be a major problem for halibut and groundfish fisheries of the Bering Sea and the Gulf of Alaska. Bycatch occurs when nonselective fishing gear operates in areas where the distribution of populations of groundfish species and halibut, mainly juveniles, overlaps. Bycatch rates, defined as bycatch weight per ton of total groundfish catch, are bound to fluctuate in space and time as a result of variation in the relative abundance of halibut and groundfish species. This analysis focuses on spatial and temporal halibut bycatch variations in the bottom trawl and longline fisheries for Pacific cod in the Bering Sea.

Estimates are provided for the losses to the halibut fishery imposed by bycatch in the bottom trawl and the longline fisheries, in time and space. One pound of bycatch does not necessarily result in one pound of yield loss. Bycatch inflicts different kinds of losses to the halibut setline fishery. One is the yield loss corresponding to the catch that would have resulted if the bycaught fish had remained in the water. Another loss is that resulting from halibut management regulations applied to the setline fishery that reduces halibut catches limits to compensate for absence of reproductive output given the absence of the bycaught fish in the population. These losses, on a per weight basis, vary with the size composition of the incidental catch, and that size composition varies in space and time, both in the trawl and in the longline Pacific cod fisheries. For a given biomass, greater proportions of small halibut represents higher losses to the fishery than higher proportions of large halibut, because the growth of small fish out paces the loss due to natural mortality.

Materials and Methods

Data used in the analysis

Data for the study are from individual bottom trawl hauls and longline sets from the 1990 and 1991 domestic Pacific cod fishery operations in the Bering Sea. Data were provided by the National Marine Fisheries Service (NMFS), Alaska Fisheries Science Center, Seattle. Data consist of groundfish and halibut catch, and halibut bycatch length frequency records. Catch records contain information on groundfish catch by target species and total, halibut bycatch, location of the operations, total catch weight and weight of allocated species. Length composition of the bycatch was available for some of the areas considered in the analysis. The definition of the Pacific cod fishery corresponds to the 1991 NMFS target species definition which is based on the total groundfish catch weight, computed on a weekly basis. Basically, Pacific cod target definition is assigned to catches, on a vessel basis, where the weekly weight of turbot is less than 35% of the catch and the weight of Pacific cod is 45% or more (catch excludes prohibited species and other non-allocated species). Spatial resolution for the analysis is shown in Figure 1.

Procedures

Overall comparison of bycatch rates between areas and months: Halibut bycatch rate (kg/ton of groundfish weight) varies with the species composition of the catch (Berger *et al.* 1989, Clark 1990, Adlerstein 1991, 1992). Thus, bycatch rate was modelled as a function of the proportion of Pacific cod, the dominant species in the Pacific cod fisheries. An analysis of covariance was performed, in which the linear model incorporates the independent variables area and month as fixed factors and the proportion of Pacific cod in the catch as a covariate. The full model is as follows

$$Y_{ij} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + (b_i + b_j)X_{ij} + b_{ij}X_{ij} + \epsilon_{ij}$$

where

Y	= bycatch rate ln[(halibut kg/groundfish ton)+1]
i	= month
j	= area
X	= proportion of Pacific cod (tons/ton) in the catch
ε	$\sim$ N $(0,\sigma)$

The trawl and longline fisheries do not generally overlap in time nor space, thus, the analysis was performed for each fishery separately and using data from different months and areas. Similarly, fisheries in 1990 and 1991 did not occur in the same fashion, thus the analysis was performed for years separately and using different month and area combinations.

Defining spatial-temporal units: The analysis compared the slopes of the linear predictors of bycatch rates between areas accounting for months (b_j), and between months within areas (b_i). This was to determine what areas experienced different rates (accounting for monthly differences), and within areas in what months rates were different from each other. The analysis first tested the corresponding model slopes, and if significantly different it used multiple comparisons of the slopes applying a Tukey test (Zar 1984).

Estimation of yield losses: Once spatial-temporal rate units by fishery were identified, the yield loss per pound of bycatch was calculated for units for which length frequencies were available. The procedures to estimate yield loss were described in Sullivan (1990). Two kinds of losses occur in relationship with bycatch. One is the yield loss caused by the absence of the bycaught fish in the population that are unavailable to the fishery when reaching 81 cm of length, the legal size of capture. The procedure estimates this loss by simulating the dynamics of the bycaught fractions of the halibut population as if not caught, and subjecting them to the setline fishery as they reach 81 cm of length. The population fractions correspond to the numbers of fish at length in the longline and trawl bycatch, and these numbers are subjected to natural and fishing mortality, and to individual growth. Natural mortality is assumed to be 0.2, constant with time, and with age of the fish. Fishing mortality is assumed to be the product of a full recruitment fishing mortality and a length specific selectivity to the halibut setline. Full recruitment fishing mortality was taken to be 0.22, corresponding to the average of the estimated fishing mortalities from 1974 to 1988 (Sullivan 1990). Selectivity at length is from Clark (1993). Selectivity for fish under 81 cm, the minimum size of capture, was taken as 0, although some fish are caught and when returned to the ocean a discard mortality can occur. Individual growth is assumed linear with a fixed increment of 10 cm per year up to age 8, and of 7 cm per year in older fish. From the projected number of fish, the yield that these fish could have produced is calculated using a Baranov catch equation.

A second source of yield loss results from management actions imposed on the setline fishery as a result of bycatch. Because the bycaught fish will not contribute to the reproductive output of the population, the halibut allowable quota is decreased to insure that the amount of eggs that should have been produced by the bycaught fish is actually spawned by the remaining population. The weight of the current population required to produce the amount of eggs that one pound of bycaught fish would have had produced in a 20 years time horizon is the adult reproductive compensation (ARC) factor. The forfeited biomass is eventually available for harvesting in future years. Nevertheless, a 33% yield loss results when harvesting is delayed (Adlerstein 1992). A combined loss factor was estimated as the sum of the yield loss factor due to the absence of the fish and the yield loss factor due to compensating for reproduction. Finally, the loss to the setline fishery per ton of groundfish catch was estimated as the product of the bycatch rate, combined loss factor, and bycatch mortality (to account for the fact that not all bycaught fish are believed to die). A 75% mortality was assumed for trawl bycatch, and a 16% for longline bycatch (Williams 1991).

Results

Overall month and area comparisons

The results indicate that three way interactions between area, month and proportion of cod b_{ij} are insignificant in both fisheries and in both years (1990 trawl fishery $F_{(15,2560)}= 0.940$, probability of F >0.25; longline fishery $F_{(17,3605)}= 1.281$, probability of F >0.10.. 1991 trawl fishery $F_{(5,1643)}= 1.938$, probability of F >0.05; longline fishery $F_{(22,2516)}= 1.045$, probability of F >0.25). Also, results indicate that the interactions between month and area are not significant: (1990 trawl $F_{(15,2560)}=1.129$, probability of F >0.25; longline fishery $F_{(17,3605)}=1.430$, probability of F >0.10. 1991 trawl fishery $F_{(5,1643)}= 1.452$, probability of F >0.10; longline fishery $F_{(22,2516)}=1.354$, probability of F >0.10). Thus, results indicate that the effects of area and month can be evaluated independently from each other.

Area: The hypothesis that introducing area as a factor does not improve significantly the model fit was rejected for the 1990 and 1991 trawl and longline fishery analyses. The results show that improvement of the model fits is significant when area is incorporated in the model. For the **1990 trawl** fishery analysis, using data from areas 511, 513, 517, 519, 521, 522, and 540, $F_{(12,2575)}= 50.61$; probability of F <0.0005. For the **1991 trawl** fishery using data from areas 511, 517 and 519, $F_{(4,1650)}= 18.59$; probability of F <0.005. For the **1990 longline** fishery analysis,

using data from areas 517, 521, and 522, $F_{(4,3642)}$= 59.03; probability of F <0.0005. For the **1991 longline** analysis using data for areas 517, 521, 522 and 540, $F_{(6,2578)}$= 51.71; probability of F <0.0005. Thus, results indicate that halibut bycatch rates in the cod trawl and longline fisheries vary significantly between areas after accounting for monthly differences, and differences in the proportion of cod in the catch.

Month: The hypothesis that introducing month as a factor does not improve significantly the model fit was rejected for the 1990 trawl, and the 1990 and 1991 longline fishery analyses. But, the 1991 trawl data analysis shows that the effect of month is not significant. This is because 1991 data were available for the few months that in 1990 showed no significant differences. In the rest of the cases the results show that model fit improvements are significant when month is incorporated. **Trawl 1990** fishery analysis used data from January to June and December: $F_{(12,2575)}$ =21.04; probability of F <0.005. Analysis of the **1991 trawl** fishery used data from January to April, $F_{(6,1650)}$= 1.29; probability of F >0.10. Analysis of the **1990 longline** fishery used data from January to December: $F_{(22,3642)}$ =22.14; probability of F <0.0005. Analysis of the **1991 longline** fishery used data from January to October, $F_{(18,2516)}$= 37.96; probability of F <0.0005. Thus, results indicate that halibut bycatch rates in the cod trawl and longline fisheries vary significantly between month after accounting for cod proportion and spatial differences.

Multiple comparisons between areas and month

Longline fishery: Comparison of bycatch rates in the **1990** longline fishery indicate that accounting for monthly variations, rates occurring in areas 517, 521, and 522 were significantly different ($q_{(0.05,3670,3)}$>3.31 in all multiple comparisons). In the **1991** fishery, rates in areas 517, 521, 522 and 540 were significantly different to each other ($q_{(0.05,3633,4)}$>3.63 in all cases). In both years highest rates occurred in area 517 or 540, and lowest in 521.

Comparisons in all areas between months indicate that rates experienced during June, July and August were higher (α = 0.05) than in the rest of the year. Detailed results of the multiple comparisons are presented in Appendix 1. Month with similar bycatch rates are:

		critical q
517 90	July Aug Sept Oct Nov Dec June	$q_{(0.05,481,7)}$=4.17
91	Jan Feb Mar Apr May Aug Sep Oct June July	$q_{(0.05,192,10)}$=4.47
521 90	Apr May Aug Sep Oct Nov Dec June July	$q_{(0.05,481,9)}$=4.38
91	Jan Feb Mar Apr May Sep June July Aug	$q_{(0.05,933,9)}$=4.38
522 90	Feb Mar Apr May Aug Sept Oct Nov Dec June July	$q_{(0.05,1307,11)}$=4.55
91	Jan Feb Mar Apr May Aug Sept June July	$q_{(0.05,1321,9)}$=4.38
540 91	Feb Mar Apr	$q_{(0.05,128,3)}$=3.31

Trawl fishery: Comparison of bycatch rates in the **1990** trawl fishery indicate that, accounting for monthly differences, rates were similar in areas 511 and 513, 519 and 517, and 522 and 540. In area 521 rates were unique. In the 1991 fishery rates were similar in areas 517 and 519 and unique in 511.

Comparison between month within areas indicate that in 1990 areas close to the Bering Sea flats, as 511, 517 and 519, rates were higher in May than in the rest of the month. In areas 521 and 522 rates were higher in June. In 1991 rates between January and April were similar in all areas analyzed. Detailed results are in Appendix 1. Months with similar rates in 1990 are:

		critical q
511+513	Jan Feb March April May	$q_{(0.05,513,5)}$ =3.86
517+519	Dec Jan Feb March April May	$q_{(0.05,1121,6)}$=4.03
521	April May June	$q_{(0.05,290,3)}$ =3.31
522+540	March Apr May June	$q_{(0.05,362,4)}$ =3.63

Yield loss

Results of the estimation of yield loss by spatial and temporal units of similar

bycatch rates in the longline fishery indicate that across areas and month 0.9 to 1.2 pounds are lost per pound of bycatch (Yield loss) due to the absence of bycaught fish. Results also indicate that 0.6 to 0.9 pounds of catch limit reduction are need per pound of bycatch (ARC) to maintain the reproductive output of the population as if bycatch had not occurred in the longline fishery. Little variation in these two quantities among areas and months occurs given that longline gear is selective towards large fish; thus, the size structure of the bycatch in the longline fisheries is very similar between areas and within months. The yield loss and the reproductive compensation factors are dependent on the size structure of the bycatch. Bycatch mortality, in tons of bycatch by ton of groundfish in this fishery, ranges from 0.028 to 0.001. This is the net effect of the longline bycatch imposed on the halibut fishery assuming that an 84% of the bycaught fish survive. Results by spatial and temporal units for which length frequency were available are:

Longline	Area 517			Area 521		Area 522		
1990	Jun	Jul-Ag	Sp-De	Jun-Jul	Ap-My /Ag-Dc	Jun-Jul	My/ Ag-De	Fb-Ap
Yield loss/lb	1.0	0.9	1.1	1.0	0.9	1.0	1.1	1.2
Egg loss/lb	24822	23581	26573	25128	26990	25575	26076	27550
ARC /lb	0.7	0.6	0.7	0.8	0.7	0.7	0.7	0.7
Bycatch/ton	0.143	0.037	0.056	0.054	0.018	0.046	0.026	0.005
Total loss	1.2	1.1	1.3	1.2	1.2	1.3	1.3	1.4
Net yield loss/ton	0.028	0.007	0.012	0.011	0.004	0.009	0.006	0.001

Longline	Area 517		Area 521		Area 522			Area 540
1991	Jan-May Aug-Oct	Jun-Jul	Jan-My/Sp	Jun-Aug	Jan-Apr	My-Sep	Jun-Jul	Feb-Apr
Yield loss/lb	1.0	0.9	1.0	1.0	1.1	1.2	1.1	1.1
Egg loss/lb	27467	25076	25550	25786	29238	27905	27182	25350
ARC /lb	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7
Bycatch/ton	0.030	0.081	0.010	0.032	0.008	0.023	0.061	0.100
Total loss	1.2	1.1	1.2	1.2	1.4	1.4	1.3	1.3
Net yield los/ton	0.007	0.014	0.002	0.006	0.002	0.005	0.013	0.020

In the trawl fishery, yield loss per pound of bycatch due to the absence of bycaught fish ranges from 3.7 to 1.1, and the reproductive equivalent from 2.3 to 0.8. Larger monthly variations occurred in areas were the size structure of the bycatch varies considerably. This is the case of areas where most of the year bycatch is dominated by small fish, and in a few months adults migrate into them. During months when juveniles are dominant, loss per pound of bycatch is high. But, in the late spring (May) bigger fish are present in the bycatch and the loss per pound of bycatch decreases. This situation results in the following fact: in areas where bycatch is dominated by small halibut, although bycatch rates are higher in late spring, the net losses during this period are lower than during Winter and early Spring. In areas where the size structure does not change dramatically, net losses to the halibut fishery are higher during late spring and summer. Results for months for which length frequency data were available are presented in the following table.

Trawl 1990	Area 511		Area 517			Area 521		Area 522	
	Jan-April	May	Dec-Feb	Mar-April	May	Apr-May	June	Mar-May	June
Yield loss/lb	2.8	1.4	2.1	1.8	1.1	1.3	1.3	1.3	1.1
Egg loss/lb	63668	29746	45259	42172	29089	29898	29151	27861	27474
ARC /lb	1.8	0.8	1.2	1.1	0.8	0.9	0.8	0.8	0.7
Bycatch/ton	0.012	0.021	0.015	0.021	0.059	0.001	0.005	0.005	0.017
Total loss	3.4	1.6	2.5	2.2	1.4	1.6	1.6	1.6	1.3
Net yield loss/ton	0.031	0.025	0.028	0.034	0.062	0.001	0.006	0.006	0.017

Trawl 1991	Area 511	Area 517
	Jan/Feb/Apr	Jan-Apr
Yield loss/lb	3.7	2.4
Egg loss/lb	85251	53258
ARC /lb	2.3	1.5
Bycatch/ton	0.016	0.030
Total loss	4.5	2.9
Net yield loss/ton	0.054	0.065

Discussion and Conclusions

Results indicate that, at the scale of resolution chosen, spatial and temporal variation in bycatch rates experienced in the Bering Sea Pacific cod longline and trawl fisheries is significant. Results indicate that in both fisheries bycatch rates are higher in areas close to the southeast corner of the Bering Sea flats in front of Unimak Pass (517 or 511) than in the other areas (521 and 522), and that rates are higher during June through August among the months with available data.

In the longline fishery, bycatch rates are high in June and July in 1990, and from June to August in 1991. There are some slight differences between the two years analyzed. In this fishery the size composition of the bycatch is similar between areas remaining practically unchanged year round. The net yield loss per month are higher between June and August according to the fluctuations in bycatch rates. Applying the results of this analysis to spatial-temporal bycatch regulations in the longline Pacific cod fishery is straight forward: discouraging the longline fisheries during June and July should produce bycatch savings.

In the trawl fisheries bycatch rates are high in May and June in 1990. No data were available in 1991 to detect temporal variations. In this fishery the size structure of the bycatch varies dramatically between areas and within month. In areas 511 and 517 small fish are more abundant than in other areas for which data were available. And within those areas small fish are less dominant during the summer. Thus, the net loss does not follow the bycatch rate fluctuations. For example, in area 511 bycatch rates are higher in May, but net loss to the halibut fishery in that month is lower than during the rest of the year. Thus, there is no overall recommendation for time-area management. In areas other than 511 restricting trawl fishery during May and June should result in savings in bycatch and yield loss. It should be kept in mind that these conclusions are based on data with restricted spatial and temporal distribution.

Savings resulting from closing the longline and trawl fisheries in 1990 and 1991 during the months of highest net yield loss were estimated. Calculations assume that closing the fishery within areas in particular month does not change their bycatch mortality rates during the rest of the year. Bycatch reductions from closing the longline fishery during peak months in 1990 and in 1991, on a per weight basis, range from 50 to 60% in area 517, from 64 to 67% in area 521, and from 80 to 85% in area 522. In the trawl fishery bycatch reductions during peak months in 1990 would have been 65% in area 517, 83% in area 521, and 75% in area 522. Catch data to estimate the yield loss that could have been saved in both fisheries by closing the fisheries during month of high losses was available at the time of the study.

It is unfortunate that the distribution of the available data is restricted to a few months.

In particular, data from the trawl fishery is concentrated in the first months of the year. This fact precludes determination of the best time and place for conducting fisheries with respect to bycatch savings. Perhaps analysis of data from joint venture fisheries in the past could be used to obtain further information on the time-space dynamics of the halibut population. Also, encouraging some fishing in all areas and months would provide useful data for research and monitoring of the halibut bycatch in the future.

Bycatch rate variation is the result of the dynamics of the different components of the fish populations involved in the fisheries. These dynamics are due to severe seasonal environmental variations in the Bering Sea that have resulted in complex migratory patterns of the species populations of that area. Bycatch in the Pacific cod Bering Sea fisheries is made up by juvenile and adult halibut. The age structure of the bycatch varies between areas within a year, following spawning and feeding migrations of the adults and the seasonal movements of juvenile halibut. During winter adults are in the spawning areas in waters deeper than 200 meters on the continental slope. In spring these adults start migrating to their feeding grounds in the Bering Sea flats where they remain until the fall (Best 1981). The presence of the adults in the feeding grounds causes fluctuation of the bycatch rates of the longline and trawl fisheries as they occupy the different regions in the Bering Sea flats. Juveniles overwinter in the south west corner of the Bering Sea flats and start migrating north in spring (Best 1977). In summer they are dispersed in coastal waters through out the Bering Sea. The concentration of these juveniles in the southwest corner of the flats causes high bycatch rates in the trawl fishery in those areas in the winter. The even higher rates in those areas in spring and summer are due to the incoming adults.

Understanding of the spatial and temporal dynamics of the determinants of the bycatch is a key to conceiving fishing strategies to ease the bycatch problems in the groundfish fisheries. It is through the understanding of the system that we will be able to explore adequate spatial and temporal definitions that offer the best scenarios to harvest groundfish allowable catch quotas within desirable halibut bycatch limits. Ideally, bycatch quotas should be in terms of yield loss inflicted to the setline fishery, given that on a per weight basis bycatch does not always produce the same loss. Results obtained in this study provide solid basis to further explore temporal and spatial variation of bycatch rates in other fisheries to be used in fisheries management. Further analysis of bycatch age (or length) structure in time and space would help elucidate the spatial and temporal dynamics of the population and the effect of bycatch in the setline fishery.

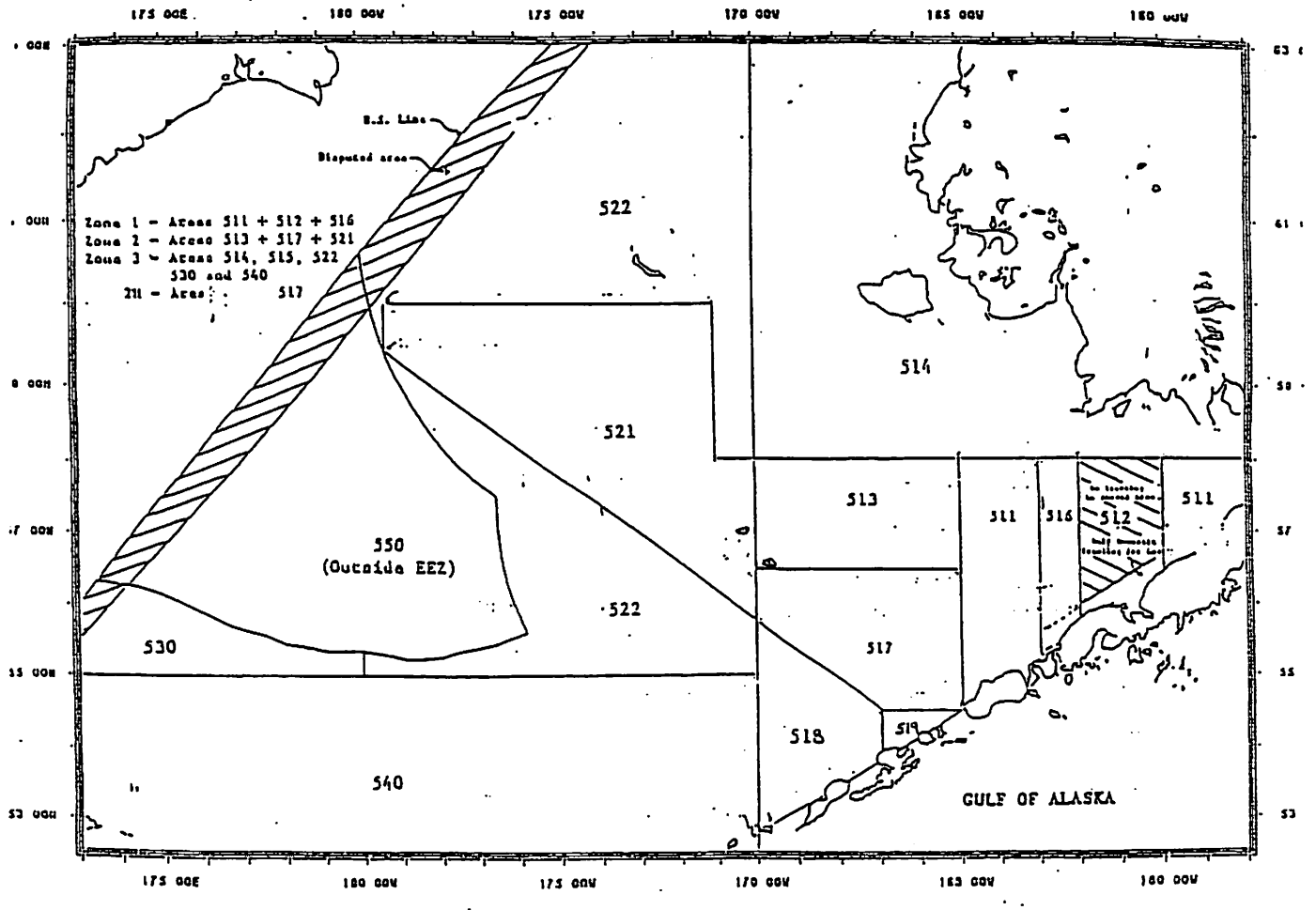


Figure 1. 1990 three-digit INPFC statistical areas of the Bering Sea.

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Appendix 1

Longline fishery

1990	q	q*	1991	q	q*
517 / 521	12.30	3.31	540 / 521	16.1	3.63
517 / 522	11.86		540 / 522	12.5	
522 / 521	3.63		540 / 517	8.3	
Area 517					
June/ Aug	6.64	4.17	Jul/ Feb	5.28	4.47
June/ July	5.65		Jul/ Mar	5.23	
June/ Dec	4.83		Jul/ Oct	5.76	
June/ Oct	4.74		Jul/ Aug	4.98	
June/ Sept	4.54		Jul/ Sept	5.02	
June/ Nov	5.12		Jul/ May	4.55	
Nov/ Aug	4.87		Jul/ Apr	4.87	
Nov/ July	5.09		Jul/ Jun	2.46	
Nov/ Dec	2.83		Apr/ Feb	2.86	
Aug/ July	3.54				
Area 521					
July/ Apr	6.67	4.39	Aug/ Mar	6.10	5.34
July/ Oct	11.91		Aug/ Apr	5.89	
July/ May	5.97		Aug/ Feb	6.06	
July/ Mar	9.92		Aug/ Jan	5.77	
July/ Sep	8.08		Aug/ Nay	5.44	
July/ Aug	7.18		Aug/ Sep	5.83	
July/ Dec	4.43		Aug/ Jul	3.74	
July/June	3.97		Sep/ Mar	2.96	
Dec/ Apr	4.22				
Area 522					
June/ Apr	11.55	4.55	Jun/ Mar	9.29	4.47
June/ Mar	15.19		Jun/ Apr	9.44	
June/ May	7.31		Jun/ Feb	5.62	
June/ Feb	6.95		Jun/ Jan	4.75	
June/ Sept	8.31		Jun/ Sep	4.51	
June/ Oct	6.79		Jun/ Aug	4.99	
June/ Aug	7.32		Jun/ May	4.80	
June/ Nov	6.52		Jun/ Jul	3.91	
June/ Dec	4.87		Sep/ May	2.55	
June/ July	1.68				

Longline fishery(Cont)

1990	q	q*	1991	q	q*
Dec/ Apr	7.35				
Dec/ Mar	9.34				
Dec/ May	5.43				
Dec/ Febr	2.69				
Apr/ May	4.17				

1991

Trawl fishery

1990	q	q*	1991	q	q*
517/ 521	9.11	4.17	519/ 511	7.99	3.31
517/ 540	12.81		519/ 517	2.98	
517/ 522	8.57				
517/ 513	4.95				
517/ 511	4.95				
517/ 519	1.95				
519/ 513	2.33				
511/ 521	14.84				
511/ 540	6.74				
511/ 522	6.10				
511/ 513	0.41				
522/ 540	2.46				
540/ 521	5.82				

Area 511+513

May/ Apr	4.53	3.86
May/ Mar	3.92	
May/ Feb	5.32	
May/ Jan	4.22	
Jan/ Apr	1.39	

Area 517+519

May/ Feb	7.84	4.03
May/ Jan	5.83	
May/ Dec	5.42	
May/ Apr	5.57	

Trawl fishery

1990	q	q*	1991	q	q*
May/ Mar	4.52				
Mar/ Feb	6.32				
Mar/ Jan	4.46				
Mar/ Dec	4.81				
Mar/ Apr	3.51				
Dec/ Feb	2.81				
Area 521					
June/ Apr	5.56	3.31			
June/ May	4.68				
Apr/ May	1.05				
Area 522+540					
June/ Mar	4.71	3.63			
June/ Apr	4.02				
June/ May	3.89				
May/ Mar	2.79				

EXECUTIVE SUMMARY FOR BSAI AMENDMENT 24

ALLOCATING THE PACIFIC COD TAC BY GEAR AND/OR DIRECTLY CHANGING THE SEASONALITY OF THE COD FISHERIES

BACKGROUND

With the exception of sablefish, no BSAI groundfish TAC is allocated explicitly by gear. At its January 1992 meeting, the Council asked staff to prepare an amendment package that included alternatives to establish fixed allocations of the Pacific cod TAC by gear. The Council's request was, in part, the result of a proposal it received from the North Pacific Fixed Gear Coalition that proposed that fixed gear operators be given preferential access to certain groundfish species in the BSAI.

At the September 1992 meeting, the Council reviewed the preliminary analysis of allocating the BSAI Pacific cod TAC among gear types. Based in part on deficiencies that were discussed in the initial Draft, the AP and SSC recommended that those deficiencies be eliminated and that a revised draft be prepared. The Council accepted these recommendations, asked that the revised draft include an analysis of alternatives designed explicitly to change the seasonality of the cod fisheries, and asked that the revised draft be available in time for the Council to decide at its April 1993 meeting whether to release it for public comment. The latest Draft analysis was mailed to you on April 12, 1993.

The analysis reviews the impacts of two types of changes. One would establish explicit allocations of the cod TAC among the trawl, longline, and pot groundfish fisheries. The other type of change would affect the seasonality of the cod fisheries by changing the fishing season for Pacific cod from January 1 - December 31 to September 1 - August 31 and/or by establishing an explicit distribution of the cod TAC among the following trimesters: January - May, June - August, and September - December. The fishing season can be changed with a regulatory amendment. The other changes would require an FMP amendment. The Council can consider making one, both, or neither of these two types of changes.

With respect to establishing explicit allocations by gear, the options considered range from only bycatch amounts of cod for the trawl fisheries to only bycatch amounts of cod for the longline and pot fisheries. The blend estimate of total cod catch for 1992 is 205,326 mt and the TAC was 182,000 mt. The blend estimate of cod bycatch in other trawl fisheries is 42,387 mt. This is 20.6% of the total cod catch or 23.3% of the cod TAC. The blend estimate of cod bycatch with all non-trawl gear is 355 mt. This is about 0.17% of the total cod catch or 0.20% of the cod TAC. Using these data, the range of allocations of the cod TAC to the trawl fishery would be from between 20.6% and 23.3% to over 99%.

Three processes are being considered for changing the seasonal allocation once it is established. They are: (1) an FMP amendment, (2) a regulatory amendment, and (3) a framework that could be used annually.

Although the problem being addressed is the potential of a suboptimal allocation of the cod TAC among fisheries and seasons, and although a market solution, such as the use of individual transferable quotas (ITQs), may be expected to provide a better long term solution to this problem, ITQs are not being considered as an alternative at this time. This alternative was not suggested by the those who have asked for explicit allocations, it was not identified as an alternative by the Council, and it is a sufficiently complex alternative that it could take several years to develop and implement.

Currently, the analysis addresses the Pacific cod allocation proposal in a broad manner by considering many alternatives or combinations thereof. In its initial review, the Council may consider narrowing possible alternatives to more specific options. The report contains information that can be used to readily address more specific allocation options.

The Council can review the draft amendment package (Amendment 24 to the BSAI FMP) and vote to release it for public review. If released, the Council could take final action on this amendment at the June 1993 meeting. If the Council recommends specific changes to the FMP in June and if those recommendations are approved by the Secretary, the implementing regulations probably would not be in place until the beginning of the 1994 fishing year.

SUMMARY OF ANALYSES

The following is a summary of information presented in Chapter 4. That information is based on data and analyses contained in Chapters 2 and 3 and Appendices A - L. The limitations of the analyses are discussed in detail in Chapters 1 - 4 and in the Appendices, they are not repeated here.

The summary of the biological, economic, and social analyses of the alternatives are presented below by topic.

1. Expected Effects on the Biological Productivity of the BSAI Cod Resource

The distribution of cod catch among the cod fisheries and among trimesters may affect the biological productivity of the BSAI cod resource through its effects on yield per recruit and due to the effects of fishing on pre-spawning or spawning aggregations of cod. The latter includes direct effects on stock size, equilibrium yield, spawning success, and the ability to monitor successfully the attainment of the TAC.

Effect on yield per recruit

The yield per recruit model indicated that yield per recruit is not affected either by large changes in the distribution of cod catch between the cod longline and cod trawl fisheries or by a change from the current seasonal distribution to a 65%, 10%, and 35% distribution among trimesters. However, an increase in the percent of catch taken in the cod pot fishery did increase yield per recruit.

Effect on stock size and equilibrium yield

The main conclusions of the theoretical model presented in Appendix H are that fishing on spawning stocks early in the year does tend to reduce equilibrium stock size, while equilibrium catch can either increase or decrease, depending on parameter values.

Effects on spawning success

The question of the effects of fishing on spawning fish has been raised repeatedly for various stocks of fish, most recently as part of an inquiry into the status of the northern cod stock off Labrador and Newfoundland, Canada (Harris 1990). Section 6.7.0 of the report addresses Fishing on Spawning Stocks and Groups. The conclusion of that report is that there is no clear deleterious effect of fishing on spawning concentrations of cod or other marine fishes. However, as the Canadian northern cod study points out, there may be subtle effects that cannot be readily detected. Nevertheless, the history of fisheries does not indicate that fishing during the spawning period only has led to any measurable biological changes or cause reduced survival of prodigy.

Operational restrictions to limit fishing on spawning stocks have been implemented in some fisheries, including the BSAI pollock fishery. They have been implement for a variety of reasons. Although concern for spawning success may be among the reasons, it has not always been the principal reason for such restrictions. Such restrictions are easier to justify when a stock is heavily overexploited or at very low levels for other reasons and any action that may aid in the stock's recovery is of greater benefit. The BSAI cod stocks do not meet these conditions.

If the decision is made to assume that spawning success is affected adversely by the level of catch during the first trimester, there are two alternative actions that should be considered to offset the associated potential decrease in sustainable yield. One is to reduce catch during the first trimester. The other is to reduce the TAC but not catch during the first trimester. If the net benefit per metric ton of cod catch is sufficiently greater the first trimester than later in the year, the second alternative is preferable. The estimates of net benefit per metric ton of cod catch by fishery and trimester for 1991 and 1992 indicate that the benefits per ton of cod catch are much larger the first trimester and that the latter alternative should be considered.

Effect on the ability to monitor successfully the attainment of the TAC

Over the past few years, continuous improvements in NMFS monitoring capabilities have substantially decreased the potential for significantly exceeding a TAC for fisheries that last more than a few weeks. The BSAI cod fishery is expected to continue to be in that category of fisheries. The fact that there is very high observer coverage for the BSAI cod fisheries increases the potential for successfully monitoring catch regardless of its seasonal distribution. With the exception of a bycatch reserve, the 1993 TAC is expected to be taken during the first trimester without creating a substantial monitoring problem.

2. Expected Effects on Marine Mammals and Seabirds

A change in the distribution of cod catch among fisheries and/or seasons that has adverse effects on marine mammals and seabirds can impose two types of economic costs. It can decrease the value of the those marine resources and it can result in more costly restrictions being placed on the commercial fisheries. However, the current cod fisheries' interactions with marine mammals and seabirds are not thought to be large enough to have statistically significant effects on their populations. The differential effects among the alternatives being considered are thought to be even smaller. Therefore, the alternatives being considered are not expected to differ significantly with respect to their effects on marine mammal and seabird populations.

3. Impacts of Trawling on the Seabed and Benthic Community

Neither the directions nor the magnitudes of alternative-specific differences in the effects on the seabed and benthic community are known. The information that is available does not indicate that significant differences should be expected.

4. Expected Effects of Changes in the Bycatch of Prohibited Species

Due to differences in bycatch rates by fishery and trimester, changes in the distribution of cod catch by fishery and trimester can change the bycatch of prohibited species in the cod fishery. However, such changes would be modified by any associated redeployment of effort to other groundfish fisheries. Ignoring the bycatch effects of the redeployment of effort, some of the implications of the historical bycatch mortality rate data (Tables A20, and A23 - A26) are listed below. Given that the 2.0 million mt OY for the BSAI groundfish fishery was apparently taken or exceeded in both 1991

and 1992, the effective redeployment will be severely limited and, therefore, ignoring the redeployment effects probably will not result in a substantial error.

1. Based on data for 1991 and 1992, halibut bycatch mortality can be decreased by:

   a. taking all of the longline catch during the first trimester,

   b. replacing first trimester trawl catch with first trimester longline catch, and

   c. replacing any trawl or longline catch with pot catch.

2. Based on 1991 and 1992 data, decreasing cod trawl catch during the first trimester in order to increase cod longline catch the third trimester could result in either a small increase or decrease in halibut bycatch mortality in the cod fisheries.

3. Herring bycatch mortality can be decreased by replacing trawl cod catch with longline or pot cod catch. If the cod trawl fishery is eliminated, total herring bycatch in the BSAI groundfish fishery would be reduced by 0.6% based on 1992 data.

4. Crab bycatch can be reduced by replacing pot catch with trawl catch or by replacing trawl catch with longline catch. If the cod trawl and pot fisheries are eliminated, total red king and Tanner bycatch mortality, respectively, in the BSAI groundfish fishery would be reduced by less than 2% and by less than 7% based on 1992 data.

5. Chinook salmon bycatch can be reduced by replacing trawl catch with longline or pot catch. If the cod trawl fishery is eliminated, total chinook salmon bycatch in the BSAI groundfish fishery would be reduced by 11.6% based on 1992 data.

Although bycatch mortality rates vary by cod fishery and by trimester, they also vary substantially among individual operations within each fishery and trimester. This suggests that a reallocation of cod catch from a fishery and/or trimester with a high average bycatch mortality rate to one with a lower average rate generally will result in operations with higher rates being replaced by operations with lower rates; however, the opposite will also occur to some extent. Therefore, reallocating cod on the basis of gear and/or trimester alone will not be optimal with respect to bycatch management.

The current levels of prohibited species bycatch in the cod fisheries are expected to decrease catch in the fisheries that target on these species but not decrease the long term productivity of the stocks. Although there can be exceptions in which bycatch in the cod fisheries could have an adverse effect on long term productivity, such exceptions have not been identified for the cod fishery and certainly not for the bycatch differences expected among the alternatives being considered. The economic effects of decreased catch in other fisheries are considered in the calculation of net benefits (item 8).

5. Expected Effects on Coastal Community Stability

The alternatives being considered can affect the stability of coastal communities in several ways. The seasonal distribution of cod catch can affect the seasonal stability of the coastal communities impacted by the BSAI cod fisheries. However, given the seasonality of all other fisheries, it is not clear what changes in the seasonal distribution of cod catch would be beneficial to specific communities.

Community stability is also a function of the level of economic activity supported by the cod fisheries. A redistribution of catch from the cod trawl fishery to the cod longline fishery would decrease the level of economic activity in those communities where BSAI cod is processed. This is because a much larger percent of the cod catch from the trawl fishery is processed on shore. For example in 1992, 21% of the cod catch in the cod trawl fishery was for onshore processing compared to only 1% for the cod longline fishery (Table A13). The differences were about the same in 1990-92. Although the percent of catch for onshore processing was higher in the 1992 pot fishery than in the trawl fishery, in both 1990 and 1991 the percent was higher in the trawl fishery.

Community stability can also be affected by the effect the distribution of catch has on the economic viability of existing fishing and processing operations. With respect to this issue, there are both immediate and long term considerations. The decision to reduce the amount of cod available to any one of the three cod fisheries may result in some operations going out of business. However, given that the cod fishery is overcapitalized, some operations may fail even if the distribution of catch among the three cod fisheries is not changed. It is not known what the immediate effect of the alternatives would be in terms of business failures and the resulting instability of associated coastal communities.

The long term consideration has to do with the ongoing economic viability of participants in the cod fishery as a whole. Increasing the allocation either to less profitable participants or to participants with more specialized operations would tend to decrease the economic viability of the fishery during periods of less favorable market and regulatory conditions. Although profitability is thought to vary substantially within each cod fishery and to overlap among the three cod fisheries, the factory longliners appear to be the most specialized operations in the cod fisheries.

6. Historical Use of the Cod Fishery

For the domestic (DAP) groundfish fishery in the BSAI, trawl gear was dominant from 1981-92. However, its dominance decreased rapidly beginning in 1989 (Table A4). Trawl gear accounted for 100% of the domestic fishery cod catch from 1981 through 1986, 97% in each of the next two years, but only 44% in 1992. The percent of the domestic fishery cod catch taken with longline gear increased from 0% in 1986 to 3% in 1987 and 1988 and then increased very rapidly reaching 49% for 1992.

For the 12-year period as a whole, the total joint venture and domestic (DAH) cod catch was about 1,438,000 mt and the cod catch in the domestic fishery alone (DAP) was about 1,044,000 mt. Approximately 81% of the DAH cod catch and 74% of the DAP cod catch were taken with trawl gear, 17% of the DAH cod catch and 24% of the DAP cod catch were taken with longline gear, and only 1.6% of the DAH cod catch and 2.2% of the DAP cod catch were taken with pot gear.

The percent of total DAP cod catch accounted for by each of the three cod fisheries and all other fisheries for 1990-92 is as follows:

	Pacific Cod Fisheries			Other Fisheries	Total
	Longline	Pot	Trawl		
1990	28.3	0.8	51.8	19.0	100.0
1991	36.5	3.1	41.3	19.1	100.0
1992	49.1	6.7	23.3	20.8	100.0
1992 adj	39.2	7.4	30.2	23.2	100.0.

The adjusted catch estimates for 1992 (1992 adj) are estimates of what the 1992 catches would have been: (1) if the full cod trawl fishery halibut PSC bycatch allowance of 2,359 mt had been available for the cod trawl fishery, (2) if the longline fishery had been closed once its 750 mt halibut bycatch mortality allowance had been taken, and (3) if the blend estimates of catch had been used to estimate when the cod TAC and each of these two PSC allowances were taken.

The increase in the percent of catch taken with longline and pot gear was in part the result of cod trawl fishery closures beginning in 1989 due to halibut PSC allowances being taken. The closures (Table A5) provided improved market and regulatory opportunities for the use of non-trawl gear. These opportunities increased participation in the cod fishery by vessels that had been designed to use longline or pot gear and by trawl vessels that were refitted to use fixed gear either just during trawl closures or during the entire fishing year.

7. Current Dependence on the Cod Fishery

The cod factory longline fleet as a whole is much more dependent on the BSAI cod fishery in terms of either weeks of operation or product value than is the cod factory trawler fleet. However, within each fleet there are vessels that are highly dependent on the BSAI cod fishery and there are other vessels that have a very low level of dependence on the BSAI cod fishery. Similarly, the cod longline catcher boat fleet as a whole was more dependent on the BSAI cod fishery in terms of weeks of operation and much more dependent in terms of exvessel value than is the cod trawl catcher boat fleet. However, within each fleet there are vessels that are highly dependent on the BSAI cod fishery and there are other vessels that have a very low level of dependence on the BSAI cod fishery.

The dependence of a vessel on a fishery is also determined by its ability to be refitted to participate in other fisheries. Typically it is much less difficult to refit a trawler to use longline gear than it is to refit a longline vessel to use trawl gear. The reasons for this include the following: substantially greater horsepower is required for trawling; the physical configuration of a vessel including the placement of the wheel house and gear on many longline vessel would make the conversion to trawling very difficult; and trawlers typically have a large open deck with the space for the gear and sheltered deck usually used for longlining.

This difference can be used more effectively to argue against an action that will decrease cod catch with non-trawl gear than to argue in support of an action that will increase catch with non-trawl gear. To the extent that the former would displace vessels that could not readily enter the trawl fishery, a high cost could be imposed on those associated with the displaced vessels. However, to the extent that the latter would result in vessel conversions to non-trawl gear, the conversion costs may be substantial. Basically, a change from the current distribution of catch will impose adjustment costs that include displacing some vessels and perhaps building new vessels and modifying existing vessels.

8. Expected Effects on Economic Benefits to the Nation

Cod harvests in the cod trawl, longline and pot fisheries of the BSAI are three alternative uses for cod, each of which results in the production (output) of valuable food products from both cod and from the other groundfish species harvested as bycatch in the cod fisheries. Each use of cod also requires the use of a variety of inputs that are of value to society. In addition to cod, the inputs used in these fisheries include groundfish and prohibited species bycatch; fishing vessels, gear, and bait used in harvesting; the plant, equipment and materials used for processing; and the fuel and labor used throughout the production process. Each cod fishery uses a different combination of these inputs to produce a different combination of cod and other groundfish products.

The difference between the values of the outputs (revenues) and inputs (costs) for a particular use provides a measure of the net benefit of that use. Revenues are generated from sales of cod and other groundfish products and costs include the value of the inputs used to produce the fishery products. Net benefits provides a means of comparing alternative uses of cod because the sum of net benefits under various scenarios about harvest distribution among cod fisheries or across seasons provides an estimate of the overall net benefit of the cod fishery.

It is a measure that attempts to account for many of the differences among the three cod fisheries and trimesters that were discussed above. Therefore, it provides a method of summarizing the overall effects of those differences. This aggregate measure addresses gear-specific and season-specific differences in species mix, retention/discards, product mix, product prices and value, costs for groundfish and prohibited species taken as bycatch, product recovery rates, and harvesting and processing costs.

Estimates of net benefits per metric ton of cod catch (ANB) by cod fishery and trimester for 1991 and 1992 were presented in Section 2.2.13. Despite the fact that the determinants of ANB are variables that change over time and despite the other stated limitations of the estimates for 1991 and 1992, those estimates of ANB probably provide the best available indication of how a change in the distribution of cod catch among cod fisheries and trimesters would affect an important subset of net benefits to the nation. That subset of net benefits combined with the other effects considered elsewhere in this report address the principal determinants of net benefits from the cod fisheries.

It is very difficult to estimate how ANB will change over time by fishery and trimester. The detail that is provided, in terms of the components of the estimates of ANB, facilitates estimating how a specific changes in a determinant of ANB would affect the estimates of ANB. For example, if it is assumed that the discard mortality rate in the cod longline fishery will be reduced by 50%, the estimate of ANB in that fishery would be increased by 50% of the current estimate of the halibut bycatch cost per metric ton of cod catch. Not only is each such change in the determinant of ANB speculative, as is the assumption of no change, but considering only a small number of changes at a time, when in fact many of the determinants have changed, can give misleading estimates of the differences in ANB among fisheries and trimesters. Therefore, with few exceptions, such speculations will be left to the reader. However, if at its April 1993 meeting, the Council identifies specific sets of changes in the determinants of ANB that it would like to have considered, the resulting estimates of ANB could be added to this draft report before it is released for public review.

Some of the conclusions that can be drawn form the estimates of ANB and its components are listed below. These conclusions are based both on variable cost model 2 and on the higher estimates of the prohibited species bycatch costs. The higher estimates attempt to account for both the immediate and subsequent adjustments to catch quotas in the fisheries that target on the species that are prohibited species in the groundfish fisheries. The lower estimates only account for the immediate adjustments. There are two reasons why the conclusions listed below are based on variable cost model 2 (Table 1). First, for the trawl and pot fleets, model 2 uses the variable cost data provided by the industry, not the plus and minus 25% data used to generate a range; and for the longline fleet, model 2 uses what is thought to be the best variable cost data provided for that fleet. Second, a comparison using all three models would be much more difficult to present and to understand. However, because the estimates of ANB and its components are presented in Table 2 and Figures 1 - 4 for all three models, comparisons can be made using all the models or any desired combination of the models.

1. For the cod longline fishery, each 1,000 mt of cod that is transferred from the first trimester to the third would decrease net benefits by $188,000 or by $228,000 based on 1991 and 1992 data. This unexpected result is explained by the following: a decrease in the ratio of product weight to catch weight between the first and third trimesters in both years (Table D3); the increase in variable cost between the first and third trimesters both years (Table 1); and in 1992 a decrease in the average price of the principal products between the first and third trimesters (Table D2) due to the concentration of third trimester catch during September.

2. For each 1,000 mt of catch that is taken from the first trimester trawl fishery and given to the first trimester longline fishery, net benefits would be reduced by $85,000 or by $100,000 based on 1991 and 1992 data.

3. For each 1,000 mt of catch that is taken from the first trimester trawl fishery and given to the third trimester longline fishery, net benefits would be reduced by $273,000 or by $328,000 based on 1991 and 1992 data.

4. Conclusions 2 and 3 would not be changed substantially even if it is assumed that halibut bycatch mortality will be eliminated in the cod longline fishery.

5. For each 1,000 mt of catch that is taken from the first trimester trawl fishery and given to the first trimester pot fishery, net benefits would be increased by $212,000 based on 1992 data. In 1991, there was not sufficient catch in the pot fishery the first trimester to allow a meaningful comparison.

Although these comparisons in ANB can be made among cod fisheries and trimester, it is important to remember that within each fishery and trimester there are substantial differences in ANBs among individual operations. Therefore, even though the ANB for one fishery and trimester may be substantially greater than that of a different fishery and trimester, typically some of the individual operations in the latter fishery and trimester will have ANBs that are substantially greater than the ANBs of some of the individual operations in the former fishery and trimester. This means that reallocating cod on the basis of gear and/or trimester alone will not be optimal with respect to ANB for the cod fishery as a whole.

An additional problem is that the determinants of ANB for each fishery and trimester will change and those changes and their effects on ANB are very difficult to predict accurately. This means that it is much more difficult to predict whether a specific change in the distribution of the cod TAC among fisheries and trimesters will increase or decrease net national benefits than it is to estimate what the net benefits were for a recent distribution.

The problem of ANBs overlapping among individual operations for different fisheries and trimesters and the problem of not being able to predict many of the changes in ANB by fishery and trimester generally are addressed much more successfully by the market mechanism than by an allocation board or committee.

Table 1 Estimates of net benefit per metric ton of cod catch (ANB) and its components by cod fishery, trimester, and year, based on variable cost model 2 for each fishery, 1991-92.

	1991			1992			1991	1992
	Jan-May	Jun-Aug	Sep-Dec	Jan-May	Jun-Aug	Sep-Dec	Jan-Dec	Jan-Dec
Longline								
Gross	845	784	722	777	704	772	784	749
Var. cost	509	548	552	483	560	676	535	524
Hal. low	5	15	15	9	35	23	11	20
Hal. high	5	16	16	10	39	25	12	22
Oth. proh	0	0	0	0	0	0	0	0
Gf. cost	11	40	21	11	21	27	23	16
ANB w/lo	321	181	134	273	88	46	215	190
ANB w/hi	321	179	133	272	84	44	214	188
Pot								
Gross	.	671	749	1,017	658	768	710	765
Var. cost	.	336	432	431	513	907	384	507
Hal. low	.	1	0	1	0	1	1	1
Hal. high	.	1	0	1	0	1	1	1
Oth. proh	.	1	5	1	2	1	3	1
Gf. cost	.	1	1	1	4	4	1	3
ANB w/lo	.	333	315	585	141	-143	324	255
ANB w/hi	.	332	311	584	140	-144	321	253
Trawl								
Gross	1,194	.	.	1,139	.	.	1,194	1,139
Var. cost	601	.	.	577	.	.	601	577
Hal. low	25	.	.	29	.	.	25	29
Hal. high	42	.	.	50	.	.	42	50
Oth. proh	5	.	.	4	.	.	5	4
Gf. cost	140	.	.	136	.	.	140	136
ANB w/lo	428	.	.	397	.	.	428	397
ANB w/hi	406	.	.	372	.	.	406	372

Note: All figures are dollars per metric ton of cod catch. ANB w/lo and ANB w/hi, respectively, are estimates of ANB with the lower and higher estimates of the bycatch cost of prohibited species per metric ton of cod catch. There was not sufficient catch in the trawl fishery the second and third trimesters of 1991 and 1992 or in the pot fishery the first trimester of 1991 to provide meaningful estimates of ANB.

Table 2 Estimates of net benefit per metric ton of cod catch (ANB) and its components by fishery, variable cost model, and season, 1991-92.

Cod Longline Fishery

	1991			1992			1991	1992
	Jan-May	Jun-Aug	Sep-Dec	Jan-May	Jun-Aug	Sep-Dec	Jan-Dec	Jan-Dec
Gross	845	784	722	777	704	772	784	749
Var. cost mod1	476	471	473	445	474	556	473	463
Var. cost mod2	509	548	552	483	560	676	535	524
Var. cost mod3	546	562	566	515	571	678	558	546
Lo proh cost	5	15	15	9	35	23	11	20
Hi proh cost	5	16	16	10	39	25	12	22
Gf. cost	11	40	21	11	21	27	23	16
ANB mod1 w/lo	354	258	213	311	173	166	277	250
ANB mod2 w/lo	321	181	134	273	88	46	215	190
ANB mod3 w/lo	284	167	120	242	77	43	193	168
ANB mod1 w/hi	354	257	212	310	170	164	276	249
ANB mod2 w/hi	321	179	133	272	84	44	214	188
ANB mod3 w/hi	283	165	119	241	73	41	192	166

Cod Pot Fishery

	1991			1992			1991	1992
	Jan-May	Jun-Aug	Sep-Dec	Jan-May	Jun-Aug	Sep-Dec	Jan-Dec	Jan-Dec
Gross	.	671	749	1,017	658	768	710	765
Var. cost mod1	.	295	386	377	438	748	340	434
Var. cost mod2	.	336	432	431	513	907	384	507
Var. cost mod3	.	378	479	485	588	1,067	428	579
Lo proh cost	.	1	0	1	0	1	1	1
Hi proh cost	.	2	5	2	2	2	3	2
Gf. cost	.	1	1	1	4	4	1	3
ANB mod1 w/lo	.	374	362	639	216	16	368	327
ANB mod2 w/lo	.	333	315	585	141	-143	324	255
ANB mod3 w/lo	.	291	269	531	66	-303	280	182
ANB mod1 w/hi	.	373	357	638	215	15	365	326
ANB mod2 w/hi	.	332	311	584	140	-144	321	253
ANB mod3 w/hi	.	290	264	529	65	-304	277	180

Table 2 Continued.

Cod Trawl Fishery

	1991			1992			1991	1992
	Jan-May	Jun-Aug	Sep-Dec	Jan-May	Jun-Aug	Sep-Dec	Jan-Dec	Jan-Dec
Gross	1,194	.	.	1,139	.	.	1,194	1,139
Var. cost mod1	530	.	.	510	.	.	530	510
Var. cost mod2	601	.	.	577	.	.	601	577
Var. cost mod3	672	.	.	645	.	.	672	645
Lo proh cost	25	.	.	29	.	.	25	29
Hi proh cost	47	.	.	54	.	.	47	54
Gf. cost	140	.	.	136	.	.	140	136
ANB mod1 w/lo	499	.	.	464	.	.	499	464
ANB mod2 w/lo	428	.	.	397	.	.	428	397
ANB mod3 w/lo	357	.	.	329	.	.	357	329
ANB mod1 w/hi	477	.	.	440	.	.	477	440
ANB mod2 w/hi	406	.	.	372	.	.	406	372
ANB mod3 w/hi	335	.	.	305	.	.	335	305

Note: All figures are dollars per metric ton of cod catch. ANB w/lo and ANB w/hi, respectively, are estimates of ANB with the lower and higher estimates of the bycatch cost of prohibited species per metric ton of cod catch. There was not sufficient catch in the trawl fishery the second and third trimesters of 1991 and 1992 or in the pot fishery the first trimester of 1991 to provide meaningful estimates of ANB.

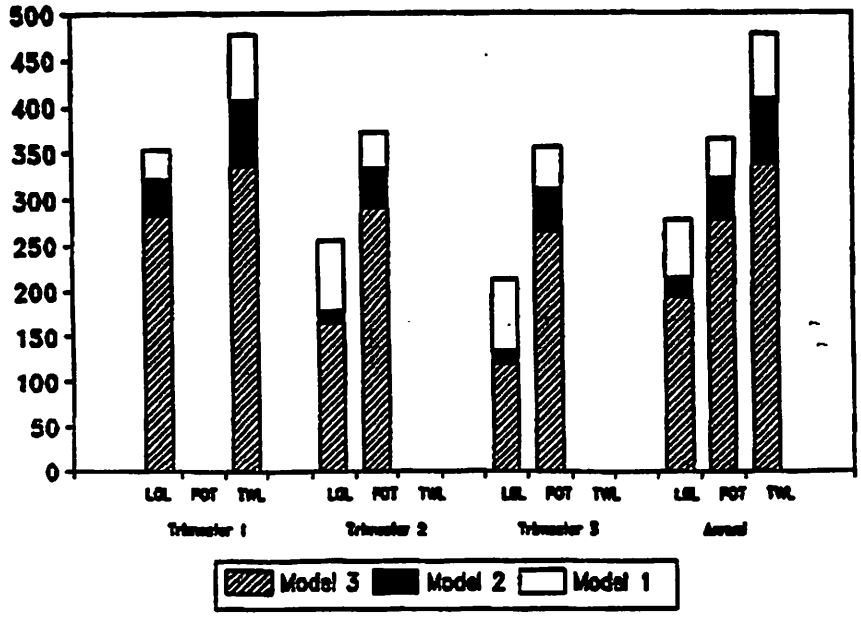

Figure 1 Estimates of ANB by fishery, trimester, and variable cost model for 1991 using the higher estimates of prohibited species bycatch cost.

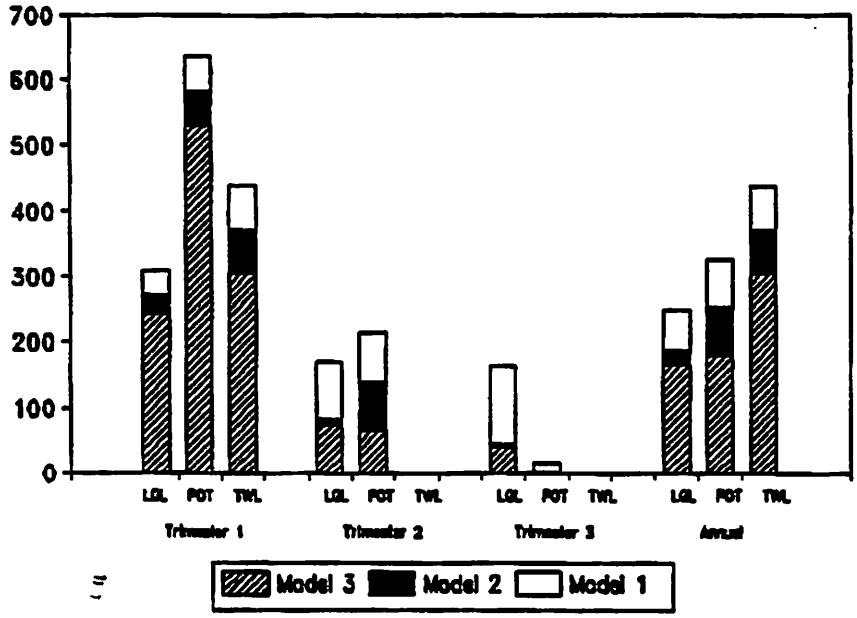

Figure 2 Estimates of ANB by fishery, trimester, and variable cost model for 1992 using the higher estimates of prohibited species bycatch cost.

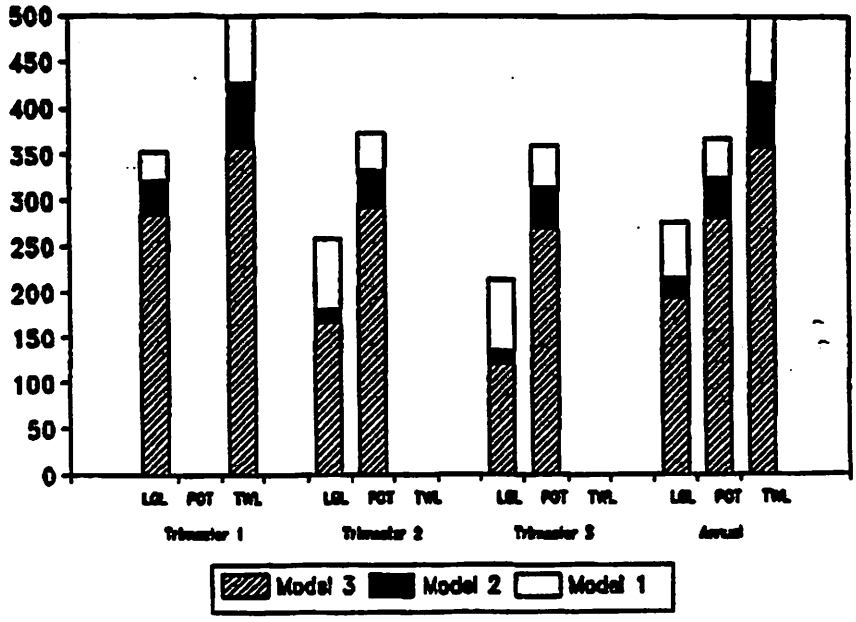

Figure 3 Estimates of ANB by fishery, trimester, and variable cost model for 1991 using the lower estimates of prohibited species bycatch cost.

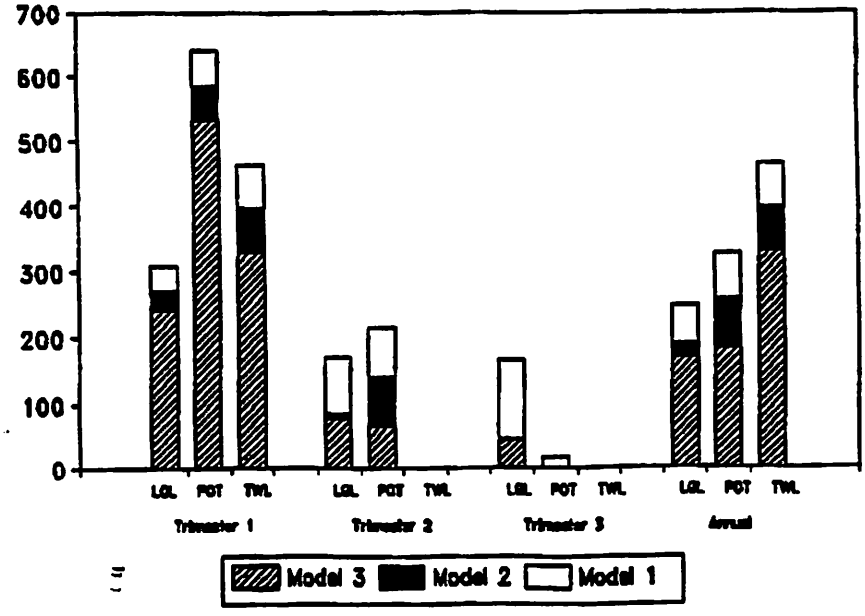

Figure 4 Estimates of ANB by fishery, trimester, and variable cost model for 1992 using the lower estimates of prohibited species bycatch cost.

9. Expected Distribution Effects

The alternatives being considered include explicit and/or implicit redistributions of cod catch among the three cod fisheries. An alternative that provides more cod for one fishery at the expense of another tends to benefit participants in the former at the expense of participants in the latter. If there had been no cod trawl fishery in 1992, the loss in product value to the trawl fishery as a whole would have been $54.3 million. The comparable estimates are $72.8 million for the cod longline fishery and $9.8 million for the cod pot fishery. It is not clear how much of this product value could be made up by increased participation in other fisheries.

The fact that the 2.0 million mt OY for the BSAI groundfish fishery apparently was taken or exceeded in both 1991 and 1992 suggests that the redeployment of effort, that will result from management action that directly or indirectly reduces the amount of cod taken in one cod fishery, will be competitive or displacing redeployment, as opposed to redeployment that increases catch in other fisheries. For example, the elimination of the cod trawl fishery would be expected to result in some former participants in the cod trawl fishery entering other trawl fisheries and the cod longline and pot fisheries or increasing their participation in those fisheries. This will decrease the loss they would otherwise bear, impose a loss on current participants in other trawl fisheries, and decrease the gain to the current participants in the cod longline and pot fisheries.

10. Expected Effects on Consumers

Due to the relatively low importance of BSAI cod in the budgets of most consumers and due to the availability of substitutes for BSAI cod, none of the alternatives is expected to have a measurable or significant effect on domestic consumers with respect to the amount of food available or the price of that food.

11. Expected Effects on Competitiveness of the US Fishing Industry

An explicit or implicit allocation of cod to operations that are currently less profitable or that could become unprofitable if market or regulatory conditions deteriorate would tend to decrease the competitiveness of the US fishing industry in domestic and world markets. The difficulty in determining which cod fishery will tend to be the most competitive and the fact that within each cod fishery there is likely to be a range of very unprofitable to very profitable operations increase the probability that the allocation decision made will decrease competitiveness. Often the use of the market mechanism to allocate resources will increase the competitiveness of the domestic industries. However, as stated in Chapter 1, this is not one of the options being considered to allocate the cod TAC among cod fisheries and cod fishermen.

12. Expected Effects on Reporting, Management, Enforcement, and Information Costs

In general, the differences among the alternatives are expected to be minimal in terms of effects on reporting, management, enforcement, and information costs.

An explicit allocation of the cod TAC that decreases catch in the cod trawl fishery would be expected to increase the need to be able to differentiate between cod catch and bycatch in the trawl fisheries. The recent closures of the cod trawl fisheries have raised questions concerning the appropriate directed fishing standard for a non-cod trawl fishery. The need to resolve this issue would be increased by a small explicit allocation to the cod trawl fishery. However, the cost associated with resolving this issue may be incurred regardless of the alternative selected because the NMFS is planning an extensive review of all the directed fishing standards. That review is expected: (1) to

result in new directed fishing standards that reduce the incentive to increase the bycatch of a species for which the target fishery is closed and (2) to provide a better understanding of what bycatch rates would be without such incentives.

The option to framework the seasonal distribution of the cod TAC would impose additional costs on the Council/NMFS annual specification process. However, that cost may not be substantially higher than the current cost of accomplishing many of the same results by apportioning PSC limits among fisheries and seasons.

13. Attainment of OY with Existing PSC Limits

Prior to the use of blend estimates of catch, it appeared that the BSAI groundfish OY had not been attained. For 1991 and 1992, the blend estimates of total catch for the TAC species in the BSAI groundfish fisheries are 2.2 million mt and 2.0 million mt, respectively. Therefore, the 2.0 million mt OY was taken in both years. Based on 1991 gear-specific and target species-specific discard mortality rates for the BSAI trawl fisheries, 1991 and 1992 bycatch rates, and 1991 and 1992 blend estimates of catch, the estimates of halibut bycatch mortality in the BSAI groundfish trawl fisheries are 4,600 mt for 1991 and 3,849 for 1992. Given that the current halibut bycatch mortality limit is 3,775 mt, it would appear that the OY can be taken without either increasing the halibut PSC limit for the trawl fishery or without decreasing the cod trawl fishery's halibut PSC allowance and cod catch.

The ability to take the 2.0 million mt OY approximately within the halibut PSC limits for the trawl and longline fisheries does at least three things. It eliminates the potential benefit of increasing the percent of the OY that can be taken with the existing halibut PSC limit by decreasing catch in the cod trawl fishery. It indicates that the appropriate measure of the cost of halibut bycatch is in terms of foregone catch and benefits in the halibut fishery, not foregone catch and benefits in other groundfish trawl fisheries (See Section 2.2.13 and Appendix D). And because it indicates that groundfish catch will be limited by the OY rather than by the PSC limits, it increases the potential for implementing a more efficient and comprehensive halibut bycatch management regime. In terms of halibut bycatch management, this decreases the potential benefits of the alternatives to the status quo that are being considered in Amendment 24.

14. Differences in the Quantity and Quality of Biological Data from the Cod Fisheries

Differences in the quantity and quality of biological data from the cod fisheries do not appear to provide much justification for favoring a specific allocation of the cod TAC among the cod fisheries and/or among trimesters.

15. Gear Conflicts and Vessel Safety

A reallocation of cod to the cod longline or pot fishery will tend to increase gear conflicts within the groundfish fishery because, typically, there are fewer gear conflicts among trawlers than they are either among non-trawlers or between trawlers and non-trawlers. A decrease in the size of the trawl cod fishery could decrease conflicts between the cod trawl fisheries and fixed gear fisheries for groundfish and crab. An increase in effort in the cod pot fishery could increase gear conflicts for all three cod fisheries and other fisheries as well

Because the potential for gear conflicts can be reduced substantially by better communications among fishermen and by other means, gear conflicts are not expected to have an important effect on the relative merits of allocation among the three cod fisheries. Although exclusive time/area openings by cod fishery could be used to eliminate gear conflicts, it is not clear that such a remedy would be needed. This solution is beyond the scope of the alternatives being considered.

Gear-specific differences in vessel safety have not been identified. However, season-specific differences in vessel safety are more apparent. The wind speed and wave height data presented in Tables A40 - A42 indicate that November through January is often the most hazardous period for fishing in the BSAI.

16. Effects on Other Fisheries

A change in the distribution of cod catch among the three cod fisheries and/or trimesters will affect both the periods of time which the vessels that participate in the BSAI cod fisheries will have available to participate in other fisheries and the incentives these vessels will have to participate in other fisheries. Although the responses of each fleet are difficult to predict, some possible effects can be identified.

Some of the vessels that participate in the BSAI cod fishery have the option to also participate in the GOA cod fishery. As a result of Amendment 23 to the GOA FMP (i.e., the Inshore/Offshore allocation), this option is limited to catcher boats and very small catcher/processors. Therefore, an alternative that reduced the catch available to one of the BSAI cod fisheries would tend to result in increased competition in the GOA by some vessels in that BSAI cod fishery.

Other potential effects on other fisheries will be identified by the AP, SSC, and Council when this report is reviewed in April and by the others after the draft is released for public review.

17. Fairness and Equity

The determination of what is fair is very subjective. The Council has often used the historical distribution of catch to define what is fair and has favored the traditional fishery. For example, the principal objective of the Inshore/Offshore allocation amendments was to prevent preemption of one group of participants by another. Alternatively, it can be argued that it is not fair to the nation as a whole to have an allocation that does not maximize the benefits that the nation can receive from its cod resources or from all resources into which cod is an input. These two definitions of what is fair often have different implications concerning what allocation is fair. The latter would include environmental benefits and costs to the extent they can be measured; therefore, it would include what some have referred to as being fair to the ecosystem. Because the rate and magnitude of change from the current distribution clearly affect adjustment costs, the historical distribution of catch is of importance in terms of both concepts of equity.

18. Difficulties Associated with Changing the Fishing Year for Pacific Cod to September - August

If it is determined that there are sufficient benefits to the cod fisheries to change the cod fishing year to September - August, two issues need to be resolved before a final decision can be made concerning the merits of such a change. The first issue has to do with allowing the cod TAC and the cod fisheries' PSC allowances to be exceeded by perhaps more than 50% for the calendar year in which the transition would take place to the September - August fishing year. The other issue is the scheduling changes that would be necessary to have a September - August fishing year. Two options are considered with respect to establishing a September 1 - August 31 fishing year for Pacific cod. Option 1 would revise the annual specification process so that final initial TAC amounts for Pacific cod and associated PSC bycatch allowances would be available for harvest on September 1 of each year. Option 2 would not significantly revise the annual specification process, but would allow for the harvest of a subsequent year's interim TAC starting on September 1 of the current year.

Additional management and administrative costs under Option 1 include those associated with (1) BSAI Plan Team preparation of a separate SAFE report or other status of stock document to support Council recommendations for Pacific cod TAC during a May - August TAC specification process; (2) Council consideration of proposed and final Pacific cod TAC specifications would require that this agenda item be addressed within a time schedule that would allow for a September 1 starting date of the Pacific cod fishery, including the possibility of a separate Council meeting in early August of each year; (3) additional NMFS staff time to prepare, review, and approve separate TAC and bycatch specifications for the Pacific cod fishery and any associated NEPA and ESA documentation and determinations, and develop separate monitoring programs for this fishery; and, (4) additional administrative and management costs associated with mid-season adjustments or respecification of Pacific cod TAC and PSC specifications if new information became available during the September - December specification process for other groundfish species that warrant such inseason revisions.

Option 2 would involve fewer administrative and management costs relative to the option 1 because a separate TAC specification process would not be required for Pacific cod. Additional costs could be incurred by the fishing industry, however, because target fishing for Pacific cod would be prohibited from the time the interim TAC or associated bycatch allowances were taken until final TAC and bycatch specifications were effective. If the interim TAC were maintained at 25 percent of the present year's TAC (about 41,000 mt based on the 1993 TAC), and assuming a weekly catch of about 7,000 mt per week (based on weekly catch of Pacific cod in all fisheries in January and February, 1993), the interim fishery could last 6 - 7 weeks before the interim TAC is reached and the Pacific cod fisheries are closed until final TAC specifications are effective.

19. Options for Changing the Allocation of the Cod TAC Among Trimesters Once the Initial Allocation Has Been Established

One alternative would amend the FMP to establish trimester apportionments of the Pacific cod TAC. Under this alternative, there are three options concerning the Council/NMFS process for changing the trimester apportionments once they have been established. They are: (1) an FMP amendment, (2) a regulatory amendment, and (3) a framework that could be used annually. The last option would be similar to the process currently followed by the Council for setting seasonal allowances for the pollock roe and non-roe seasons.

There are two major problems with a framework process that uses the pre-season TAC specification process. First, NMFS simply cannot ever complete the filing of the final specifications before the beginning of the year. The timing is wrong (too close to the beginning of the fishing year) and the more tasks the Council loads into the process, the less likely NMFS is going to be able to get the final specs filed anytime close to the beginning of the year. The second problem is more substantive, the specification process is so rushed that it is unlikely to result in carefully reasoned allocation decisions or perhaps even conservation decisions. There is doubt whether the spec process will allow NMFS time to ensure that it is meeting the requirements of other applicable law, such as, the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA) and the National Environmental Policy Act (NEPA). It is not known if GCAK would flatly say as a matter of law that apportioning the Pacific cod TAC by seasons annually in the spec process is illegal. However, GCAK probably would advise the Council against overloading the September-to-December spec process with even more substantive determinations that must be made considering that there are already more determinations required during this time period than can be accomplished with existing staff and time constraints before the beginning of the year. The so-called September-to-December process really is a November-to-February or March process, and loading more into it will delay things even more.

A framework for cod similar to that for apportioning pollock between the A and B seasons would tend to have substantially greater allocation effects than does the pollock framework. This is because the three cod fisheries are much less homogeneous than are the pollock fisheries and, therefore, the apportionments among trimesters can be used to a greater extent both to allocate the cod TAC among the three cod fisheries and to determine the benefits each fishery will receive from it cod harvest.

20. Benefits of Explicit Allocations by Fishery with Respect to Establishing Optimal Seasons for Each Fishery

In the absence of an explicit allocation of cod by fishery, the catch in each fishery is determined by: (1) the cod TAC; (2) the amount of cod that is taken in the other cod fisheries before they are closed by their halibut PSC limits; (3) the amount of cod that is expected to be taken as bycatch in other fisheries (principally non-cod trawl fisheries); (4) its own halibut PSC limit; and, particularly if the PSC limits do not constrain catch, (5) the pace at which cod is harvested in each fishery.

If each cod fishery had an explicit share of the cod TAC, a fishing season could be set for each fishery that would allow it to maximize the benefits it can derive from that level of catch. The optimal season for each fishery, which would be determined by biological, environmental, regulatory, and market conditions, could differ substantially from the current season on a yearly basis. In the absence of explicit allocations by fishery, common seasons are required and agreement on optimal common seasons is expected to be very difficult. This was demonstrated in late 1992 when the Council was unable to agree on a season change for 1993.

Most cod products are frozen and can be stored for up to a year without a significant decrease in product quality (MacCallum et. al). This has two important effects on the optimal season. First, the seasonality of demand principally affects the optimal season through storage and interest costs. Second, consistency of catch throughout the year is not required to have a consistent and predictable monthly supply of cod for specific markets.

21. Allocating the TAC by Trimester and Changing the Cod Fishing Year to September - August

One alternative is to allocate the TAC by trimester and also change the cod fishing year to September - August. If it is determined that trimester apportionments will be used, it would appear that the benefits of changing the fishing year would be eliminated for the most part and without some of the difficulties and costs associated with changing the fishing year.

There are two exceptions to this. If the objective is to assure that catch during September - December is not limited by catch during the remainder of the year, both changes would be necessary. This is because with a January - December fishing year, catch in excess of the apportionments for the first and second trimesters together would reduce the amount of the TAC actually available in the third trimester. There may also be strategic political or negotiation reasons for a group that prefers to fish in September - December to want both changes.

The potential problem of excess catch in the first two trimesters and the resulting decrease in allowable catch during the third trimester is reduced substantially for two reasons. First, as noted in Item 1, the NMFS is expected to be able to monitor the cod TAC and its apportionments successfully. Second, because the apportionment for the second trimester is expected to be much smaller than that for the first or third trimester, excess catch in the first trimester can be adjusted for by reducing second trimester catch and the probability of substantial excess catch in the second trimester is lower. Therefore, if the objective is to assure that at least a fixed percent of the TAC

is available the third trimester (September - December), seasonal apportionments probably are sufficient. If the concern is that any apportionment that is not used the first trimester (January - May) should be taken in the third trimester (September - December), not in the second trimester (June - August), the rollover rules can be written to address this concern.

It is not clear that also changing the fishing year would be an advantage to one or more of the cod fisheries in terms of the amount of the cod TAC that is reserved for cod bycatch in other fisheries. However, the fishing year change could increase the probability that cod would become a prohibited species in other groundfish fisheries in the June - August.

AGENDA D-2(b)
Supplemental

North Pacific Longline Association

April 9, 1993

North Pacific Fishery Management Council
605 West 4th Avenue
Anchorage, AK 99502

RE: Cod Mangement Proposals

Dear Council Member:

Since June of 1991 a substantial administrative record has been built in support of a series of proposals to improve managment of the BSAI cod fishery. Since submission of the original North Pacific Fixed Gear petition on cod management, a number of other relevant documents have become available - we are providing copies as attachments to this letter. Also enclosed is the original petition, with some supporting documentation.

Proposed BSAI Amendment 24 contains three separate and independent elements: a change in the season opening date, Coouncil authority to apportion cod TAC among trimesters, and gear restriction.

I. September Opening

The first proposal is that the BSAI season for cod begin September 1 each year, rather than January 1. The reasons for this proposal are straightforward and similar to those which have led the Council to change the opening dates of the pollock and flatfish fisheries. Prices for cod are a good deal higher in the Japanese market from September through February - European markets reflect the same trend. Cod are in much better physical condition during this period than they are during the post-spawning period. Even at this date we are receiving complaints from buyers: "Why are you fishing for cod now? You are catching spawned-out fish. We can get those rags cheaper in Russia. Why don't you fish in September? If I hold frozen cod from now until September it will be a number two product." Another consideration is that halibut leave the cod grounds during the winter, and halibut bycatch is reduced (please see Figure 1, attached). Finally, an earlier start will assure that excess fishing pressure is not put on spawning cod later in the year - a rationale used to justify limitation of the BSAI pollock

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roe-season catch (please see paragraph III of attached letter of Februaray 21, 1993; 56 FR 6292).

If the Council elects to change the opening date of the fishery, we will request that it consider doing so this year by transferring part of the 1994 TAC into 1993 by emergency rule. One justification for this action is the economic crisis created by the flood of cheap Russian cod in international markets (a problem now being addressed by the Committee of the Russian Federation of Fisheries).

II. Seasonal Apportionment

The Council should have the option of apportioning the BSAI cod TAC seasonally, just as it has the authority to apportion pollock between the "A" and "B" seasons - and for the same reasons.

III. Gear Restriction

Council Document #13, "Methods of Reducing the Incidental Catch of Prohibited Species in the Bering Sea Groundfish Fishery Through Gear Restrictions", reprinted as IPHC Technical Report No. 19, 1982, recommended the exclusive use of hook-and-line gear for certain demersal fisheries like the cod fishery, for the purpose of saving prohibited species (please see attachment). The many other advantages of fixed gear - size selectivity, species selectivity, product quality, reduction of discards (FIS estimates that nearly 25,000 mt of cod were discarded in BSAI trawl fisheries in 1992), avoidance of destructive impacts on the environment, avoidance of intense fishing on spawning stocks, etc., are detailed in the "Literature Referenced" section of the petition of June 3, 1991 (attached). Proceedings of the World Symposium on Fishing Gear and Vessel Design, 1988, "Recent Developments in Longline Fishing - Catcing Performance and Conservation Aspects", attached, is keyed to the video "Longline Fishing and Research" (to the Council and Advisory Panel). "A Blueprint for the Year 2,000" - costs of longlining vs. trawling in the Atlantic Canada cod fishery - is also enclosed.

Since submission of the petition, certain other documents have become available. "Fisheries Management Approaches to Longlining as Viewed from the Norwegian and Icelandic Perspectives", attached, emphasizes the use of hook-and-line gear in the cod fisheries to save small cod and maintain spawning stocks. The questions of intense fishing on spawning cod (other countries prevent it with closures) and dependence on the cod fishery are addressed in the attached letter of February 21, 1993. The Marine Fish Conservation Network, a coalition of environmental groups, has called for the use of selective gear and has identified

trawls as a non-selective gear type (see attachement). At the recent annual meeting of the IPHC, the Conference Board passed a resolution asking the NPFMC to "promptly adopt regulations requiring the use of fixed gear in the Bering Sea Aleutian Island fishery for Pacific cod, and to consider the exclusive use of fixed gear for other speices of groundfish wherever practicable, i.e. sablefish, turbot, and rockfish species." The Commission asked the Council to "give high priority to halibut bycatch reduction in allocating groundfish among different gear types" (letter attached).

Finally, the regulatory amendment requiring that hook-and-line vessels carefully release halibut bycatch has gone to the federal register. Implemented and enforced, this regulation should reduce halibut bycatch mortality in the BSAI hook-and-line cod fishery to an absolute minimum.

We hope you will review this material as you consider the Amendment 24 proposals. It comes from a wide variety of sources and authorities. Amendment 24 offers the Council an opportunity to demonstrate its concerns for product quality, bycatch reduction, gear selectivity, fishing on spawning stocks, and conservation generally.

Thank you for your attention.

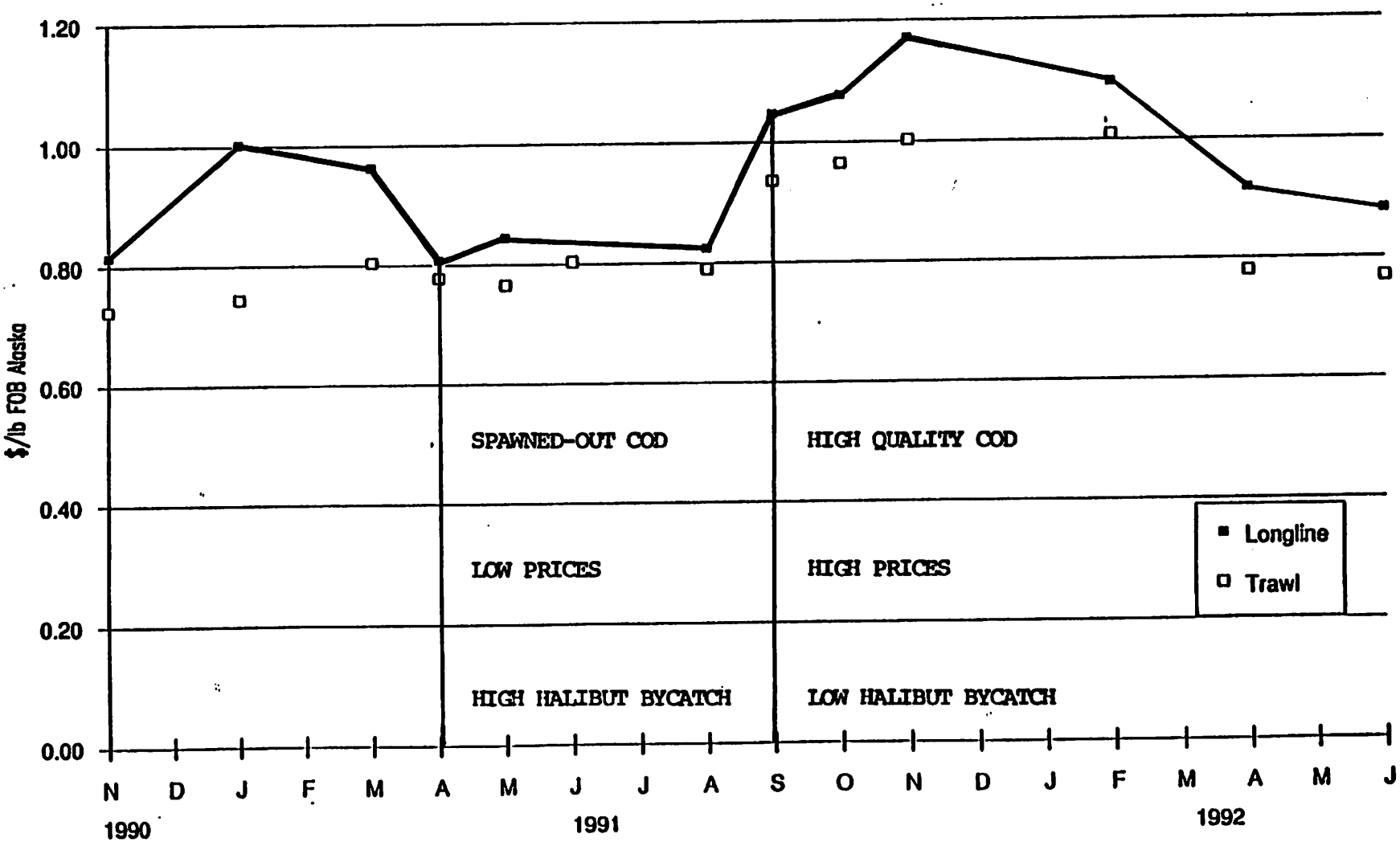
Sincerely,

Thorn

Thorn Smith

Attachments

Figure 1. Weighted average FOB Alaska prices for medium H&G cod harvested by U.S. factory trawl and longline vessels and sold at the Japanese Ishinomaki market



HAVE CORRECTIONS.

PREFERENTIAL AND SEASONAL COD ALLOCATION

My name is Thor Olsen and my background is 20 years of long-lining for halibut and black cod and the last 20 years in various other fisheries, mostly groundfish. I own one of about 30-40 boats which have trawled cod out of Dutch Harbor for the last 10-15 years. We were the first ones to harvest cod in the Bering Sea and derive all, or nearly all, of our income from cod. The proposal to allocate Bering Sea cod to fixed gear only, would take our means of livelyhood from us, who have the history, and give it to "johnny-come-lateley" groups.

If this proposal goes into effect, we will be left with only the Gulf of Alaska in which to fish. This will further shrink our already too-short fishing season and send many of us into bankruptcy. Most of our boats are too small to move into the pollock market - even if it were open to us. At this time, the pollock fleet is set, as each plant has its own quota of boats with no room for more.

Since the issue seems to be cleaner fishing, I offer some observations. For instance, has any accounting been made of the amount of fish destroyed by sand fleas when fixed gear is left out too long? When long-lining, the cod bite only during daylight hours and fishing is best in the morning. Thus the long-liner must set enough gear during daylight to be able to haul until the next morning. After a few hours, cod and halibut become food for sand fleas. The pot fleet also has sand flea problems in certain areas. However, the trawl fleet incurs no waste of either halibut or cod due to sand fleas.

As a long time long-liner, I object to the "crusifier" method where the fish is hauled into two horns, then the girdy rips the hook loose, often taking the front end of the head if the hook is fastened far enough down the throat. This unhooking procedure seems cruel, but is deemed necessary by the long-liners. It would be impossible to haul 25,000 - 30,000 hooks per day if the girdy had to stop for every fish.

The careful release method is too slow and also an unsafe working practice. When trawling in the Gulf of Alaska, about 10% of the halibut we catch have their lips ripped off. No cut gangen is found.

As to pot fishing - the average crabber loses 10-20% of his pots per year. The estimates range from 100,000 - 500,000 derelict pots in the Bering Sea, all with crabs trapped in them. When I was crab fishing, the best pot I got was when we got hold of and hauled a derelict pot. A lost cod pot likewise becomes a continuous death trap.

I remember when Sig Yeager first experimented with fish pots about 15 years ago. He left some pots out for two months. When he returned to haul them, he found they were still full of fish, however, the fish now had lots of sores on them from fighting off their cannibalistic pot mates. The pots also contained the bones of fish that had succumbed. Using the pot-loss figures (10-20 % loss ratio) of the crabbers, it is obvious that a major pot fishery for cod would soon have the ocean floor littered with thousands of derelict pots. These would be placed on our most productive cod grounds and be a death trap thereafter. Just because we don't see the losses, doesn't mean they don't take place. The degradable twine rule is not enforced. I have asked many crabbers if they have ever seen the web in a pot broken because of rotten twine. They all say "no".

Cod trawling takes place in a very, very small part of the continental shelf off Alaska; less than 1/4 % (0.25%). (All co-ordinates are recorded in our log book, if anyone cares to challenge this statement.) In the Bering Sea, most cod trawling takes place across Unimak Pass, on a strip up as close to Amak as the sea lion zone will allow. A little bit of trawling is done around the Pribilofs. Cod trawling is not profitable in 99% of Alaskan waters.

Examination of the 1/4% of the ocean floor we trawl reveals that much of that bottom is volcanic sand or rocky bottom where there are no crabs. It is only as we approach Amak that we may catch a few crabs. We who trawl cod have known all along that we caught very few crabs, but until this year, all trawling by-catches of crab were lumped together so we were blamed for what was taken by other hard bottom trawling fisheries. This year we were separated out and the NMFS estimate shows that after 10-11 weeks of trawling only 52,000 crabs were caught while catching 56,000 tons of cod. That is less than one (1) crab per ton of cod!

Crabs are extremely hardy creatures and can survive on deck for a long time. The harshest treatment a crab gets is from a professional crabber. Pots containing nearly a ton of crab, legs and heads all entangled, are lifted out of the sea and the contents dumped in totes on deck. In rough weather, the pots often slam against the rail, further jarring the trapped crabs. They are then put in the tank and piled 10-15 feet high. As the vessel rolls, the crabs constantly shift position and rub against other hard-shelled creatures. They can survive two weeks in the tank.

Compare this treatment to what they receive from the trawlers. The crabs ride to our decks cushioned and padded by soft, fleshy fish. On deck, again among soft fish, the crabs crawl around in good condition until the scuppers are opened and they are released. Crabs are not crushed on a cod trawler so the mortality rate is nearly zero. I understand that NMFS contunues to charter trawlers when doing the stock assessments of crab. Would it be possible to get good, scientific data if the tools and methods were destructive?

In 1985, I began experimenting with single, larger mesh on the top side of our codend to filter out small roundfish. We used 6-inch mesh and it worked well on small pollock. This year we changed to 8-inch as we are finding a lot of small, 2-3 pound, cod on the grounds. We are now getting very few undersized roundfish. Regrettably, a lot of trawlers are still using their small-mesh pollock codends; this must be stopped. Seven inch stretch mesh or 5 1/2 inch square mesh would be perfect size.

The age composition of cod in Bering Sea has also changed a lot the last 12 years. In the 80's we saw very few small cod, but now the grounds are crowded with an abundance of undersized cod, and the future looks bright. This present age composition, with an abundance of small cod, initially is a problem for both fixed and mobile gear. However, with large enough mesh in the codend and in the pots, small fish will be let out to survive. They must be separated out while the gear is still on the bottom. The long-line fleet does not have that capability. There are no hooks that can select the size of the fish caught.

When a small cod is brought to the surface on any one of the three gear groups, you might as well write him off as lost. If he is alive, the airbag blows due to less water pressure. If you throw him overboard, he floats and is immediately attacked by sea birds who go for his eyes, first. It is not a pretty sight.

The by-catch of halibut in Bering Sea has come down a lot this year. I credit 10-20% of this year's improvement to the fishermen and the rest to less halibut on the grounds. I feel that we are now at the end of any innovation fishermen can make to lessen the halibut by-catches.

When you compare actual halibut catches, disregarding the mortality co-efficient, in both the Gulf of Alaska and Bering Sea, you find the longliners have a much higher bycatch rate than the trawlers. Long-lining is a far more efficient way of catching halibut than is trawling. In the Gulf of Alaska, after the first three months of this year, actual catches were 7.2% for long-lining and 2.7% for all trawl fishing; a 2.67 times greater ratio. In the Bering Sea, it was 2.75% for long-lining and 1.16% for trawling; a 2.4 times higher ratio for long-lining. It is the application of mortality co-efficient that makes long-lining appear cleaner.

In conclusion, I strongly urge that we continue the present course of fishing. It is a great advantage to catch the cod in the small killing zones in which we now operate. Here is where the cod school up and they have already eaten most of the crab in these areas anyway. Fishing cod should be done only in the winter when most halibut have migrated to deeper, warmer water. Also, let us finally put an end to night trawling and set a codend mesh size large enough so small fish can escape.

We, the cod trawlers, are a shore-based group that brings shore-side jobs to Alaskan communities. We also pay fish taxes to Alaska and to burroughs. In Dutch Harbor, I see factory longliners tying up to trampers and unloading their catches, thereby bypassing Alaska's fish taxes and not creating shoreside jobs. As a long-time fisherman, I see this proposal of preferential allocation to fixed gear as totally unfair to traditional fishermen. Trawl fishing in selected zones is not dirtier than other gear groups.

Thor Olsen
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AGENDA D-2(b)
Supplemental

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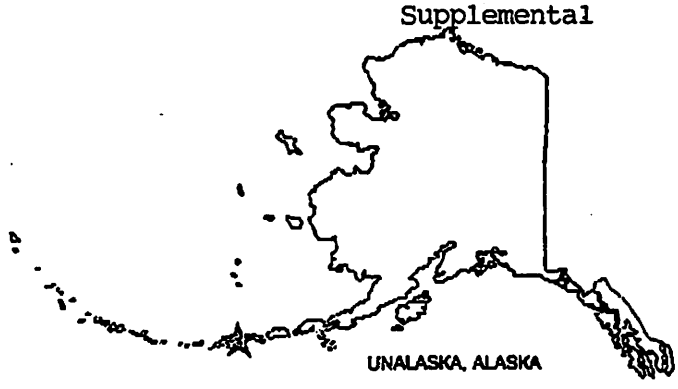

Mr. Richard Lauber, Chairman
North Pacific Fishery Management Council
605 West Fourth Avenue
Anchorage, Alaska 99501

Dear Mr. Lauber and Councilmembers:

The City of Unalaska would like to make a written comment on item D-2 Groundfish FMP Amendments, Section B, Preferential and Seasonal Allocation of Pacific Cod. We are concerned that a preferential allocation to the offshore longline fleet will do serious harm to the shoreside trawl fleet that delivers to the community of Unalaska and other coastal communities in the Bering Sea Aleutian Island area. A much reduced quota for the Pacific Cod trawl fleet will have a great impact on our community's revenues. We would face a down turn in our local 2% landing tax, our 3% general sales tax, not to mention a loss in revenue to the State of Alaska from the 3.2% tax the shore plants and 5% tax that the floating processors pay to the state. A reduced allocation to shoreside trawl fleet would affect jobs in our community ranging from the shore plants to the service sector and transportation industry. As you know, the offshore longline factory fleet pays no state or local landing taxes. They do pay 3% general sales tax to our community on goods and services received. Many of the onshore Pacific Cod bottom trawl fleet that participate in the cod fishery, which is the only fishery they work in. Many of them do not have pollock markets. They will be facing a very uncertain future if they are allocated out of the Pacific Cod fishery.

I would also like to point out that many of these vessels were the first vessels to come onshore with their product supporting the shoreside groundfish industry. They have made a significant contribution in tax dollars to our city, and the plants they deliver to pay a tremendous amount in taxes to the city and state of Alaska. We are also concerned that a preferential allocation will effect the developing pot cod fishery that is just getting started in the Bering Sea and Aleutian Islands area. This gear type has the least amount of bycatch of any gear type involved in Pacific Cod fishery. The fleet involved in this fishery has been delivering the majority of their catch shoreside. We believe that if the council decides to allocate by gear type, the pot fishery gear type should have enough allocation for this developing fishery. We support the council on their efforts to reduce bycatch in the Pacific Cod fishery and would hope that you would consider

trawl mesh regulations and place a ban on night trawling and possibly more observer coverage as a measure to control bycatch before going to a preferential allocation by gear type that would have a detrimental impact on coastal communities and shoreside plants in our area. On the seasonal allocation of Pacific Cod, we support the Council's effort on this. We believe that taking the majority of the Pacific Cod allocation during the roe season could be detrimental to the fishery, and we would support going to a quarterly or an A and B season allocation similar to what is being done in the Pollock fishery. A quarterly allocation or an A and B season set-up for Pacific Cod would provide employment in our shore plants for longer periods thru the year and would help alleviate the down periods that affect our business community and fishing fleet. Thank you for considering our comments on this important issue.

Sincerely,

Frank V. Kelty, Mayor