


MEMORANDUM

TO: Council, AP, and SSC Members

FROM: Clarence G. Pautzke
Executive Director 

DATE: April 14, 1993

SUBJECT: Other Groundfish Issues

ACTION REQUIRED

- (a) Receive status report on the Pribilof Island trawl closure analysis.
- (b) Receive discussion paper on the proposal to ban night trawling for Pacific cod in the BSAI.
- (c) Consider emergency rule to reduce bycatch of Pacific cod in the yellowfin sole trawl fishery.
- (d) Recommend trawl VIP rate standards for the 3rd and 4th quarters of the 1993 fishing year.

BACKGROUND

Pribilof Island Closure

At the December 1992 meeting, the Council was presented with a draft analysis on the proposal to close an area around the Pribilof Islands to trawling to protect important habitat for blue King crab, Korean Hair crab, marine mammals, and seabirds. The analysis considered three separate areas for closure: IPHC Area 4C, IPHC Area 4C west of 169°W, and waters within 25 nautical miles of the Islands. Testimony from the public, SSC, and AP suggested that other areas should be considered to achieve the objective of protecting crab habitat while allowing important adjacent waters to remain open for trawling. The Council recommended that ADF&G consider the SSC and AP recommendations and provide a revised analysis for review in the Spring of 1993. At this time, the analysis has not yet been completed. Staff from ADF&G will present a status report of their workplan on this issue.

Ban on Night Trawling for Pacific Cod

At the January 1993 meeting, the Council received a proposal from the Midwater Trawlers Cooperative to ban trawling for Pacific cod at night in the BSAI. It was felt that this action would reduce the bycatch of halibut in the trawl fishery, thus allowing more groundfish to be harvested prior to halibut PSC closures. The Council requested that preliminary information be available for discussion of this proposal at the April meeting. A discussion paper is attached (Item D-4(b)(1)) that summarizes the scientific studies on the day/night bycatch rates of halibut and identifies some enforcement concerns and other issues for consideration. After reviewing this information, the Council can recommend whether this proposal warrants further analysis.

Bycatch of Pacific Cod in the Yellowfin Sole Trawl Fishery

Ron Hegge has requested the Council, at this meeting, consider recommending that the NMFS Regional Director implement an emergency rule to reduce the amount of Pacific cod bycatch in the

yellowfin sole (YFS) trawl fishery. This can be accomplished by modifying the BSAI directed fishing standard regulations (675.20(h)(2)).

Standards for directed fishing for the yellowfin sole trawl fishery allow retention of up to 20 percent of the amount of other fish species (besides rock sole, yellowfin sole, "other flatfish," and arrowtooth flounder) during a trip. The YFS trawl fishery is scheduled to open on May 1 of this year, with an initial TAC of 187,000 mt.

Based on directed fishing standards and historical levels of catch and bycatch, NMFS in-season management reserves various amounts of TAC for bycatch needs for various directed fisheries. Information will be provided to you at the meeting to assist you in a discussion on this proposal. Specifically, we will provide you with historic catch and bycatch statistics for the YFS fishery, the amount of Pacific cod bycatch needs estimated by NMFS for the remaining 1993 fisheries, and a summary of the Pacific cod fishery including current catch rates and estimated closure date for the 1993 BSAI Pacific cod fisheries.

Bycatch Rate Standards for the Vessel Incentive Program

Regulations that implement the vessel incentive program (VIP) require the Council to recommend VIP rate standards biannually. The April meeting is when the Council makes VIP rate standard recommendations for the third and fourth quarters of the 1993 trawl fisheries in the GOA and BSAI. The VIP fishery categories are as follows:

<u>BSAI Fishery</u>	<u>PSC Species</u>
Midwater Pollock	Halibut (as a % of groundfish catch)
Bottom Pollock	Halibut
Yellowfin Sole	Halibut Red king crab (# of crab/ton groundfish catch)
Other Trawl	Halibut Red king crab
<u>GOA Fishery</u>	<u>PSC Species</u>
Midwater Pollock	Halibut
Other Trawl	Halibut

Note that regulations specify that the vessel incentive program for the midwater pollock fishery becomes effective after the directed fishery for pollock by trawl vessels using non-pelagic trawl gear is closed.

At this meeting, NMFS will provide an analysis of bycatch rates observed during the past two years for these fishery categories which will be useful in establishing rate standards. The Council will need to recommend to the Regional Director the bycatch rate standards for these categories for the second two quarters of the 1993 fishery. Item D-4(d)(1) provides the 1992 VIP bycatch rate standards and observed bycatch rates.

**Ban on Trawling for Pacific Cod at Night
Discussion Paper**

Background

At the January 1993 meeting, the Council received a proposal from the Midwater Trawlers Cooperative to ban trawling for Pacific cod at night in the BS/AI. It was felt that this action would reduce the bycatch of halibut in the trawl fishery, thus allowing more groundfish to be harvested prior to halibut PSC closures. The Council requested that preliminary information be available for discussion of this proposal at the April meeting. This paper summarizes the scientific studies on the day/night bycatch rates of halibut and identifies some enforcement concerns and other issues for consideration.

Biological Basis

Analysis of 1986 and 1987 Bering Sea JV bottom trawl fisheries indicated day/night differences in halibut bycatch rates, due to changes in relative abundance of target species and halibut (Adlerstein 1991). Walleye Pollock and yellowfin sole catches were more often than not associated with lower bycatch rates at night, while Pacific cod and rock sole tended to be associated with higher rates at night. The only consistent result was that the bycatch rates of halibut in catches associated with Pacific cod were higher at night.

Analysis of 1990 Bering Sea domestic bottom trawl fisheries indicated that bycatch of halibut would be reduced if night trawling was banned for Pacific cod, in particular (Adlerstein 1992). Halibut bycatch rates were higher at night for all areas and months examined. For example, in the area 511 directed cod fishery, the average halibut bycatch rate at night was 1.61 times the day rate.

Further analysis of the 1990 domestic bottom trawl fisheries in area 511 indicated that day-only trawling may reduce total halibut bycatch by 13% (Adlerstein and Trumble 1993). Alternatively, without a reduction in bycatch, groundfish harvest could be increased by about 13%. A night trawling ban may also reduce the bycatch of King crab by 13% and Tanner crab by 16% (Adlerstein and Trumble 1993).

Enforcement Concerns

A plan amendment that would ban trawling at night has potential enforcement problems, especially if the ban is not required for all trawl fisheries. Apparently, there would be no practical way to enforce the proposal short of banning all trawling at night or prohibiting the retention of any Pacific cod taken at night. In the latter case, waste could be substantially increased with little or no decrease in removal. Effective enforcement of the retention ban would be difficult at best (Dave Flannagan, NMFS Enforcement Division, personal communication). Because Directed

Fishing Standards are percentages based on trip or weekly landings, this proposal would not prohibit targeting on Pacific cod at night. An amendment to ban targeting on Pacific cod at night would also be difficult to enforce. There would be virtually no way to prove a violation short of a confession (Dave Flannagan, pers. comm.).

Other Considerations

A ban on night trawling may raise allocative issues. For example, a night ban for cod would allow trawlers to harvest more cod per unit of halibut bycatch, and thus may increase the total amount of cod and other groundfish caught by trawlers. If the 1990 data for area 511 are representative, bottom trawlers could harvest up to 13% more Pacific cod. In turn, the amount of cod available for harvesting by other gear types would be reduced.

There may be some economic issues to consider. Vessels may incur some costs associated with not trawling for cod at night. Added costs may be incurred with increasing travel time, lost fishing opportunities, and moving to avoid cod concentrations at night. The costs may differ between vessel sizes, proximity to the fishing grounds, and fishing seasons (quarters).

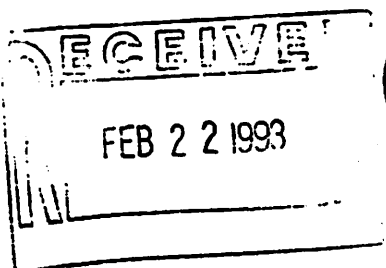
Because the amount of daylight in the Bering Sea area varies by season, with much fewer hours of daylight in the winter, allowed fishing times will need to be set on a seasonal basis. For example, at 55° N Latitude, daylight ranges seasonally from about 18 hours in June to only 6 hours in December. If fishing were allowed only during daylight hours, effort would be severely restricted in the winter months. Perhaps a set number hours for each season (quarter) would be more appropriate than daylight hours.

Literature Cited

Adlerstein, S. 1991. Comparison of day and night bycatch rates in Bering Sea joint venture bottom trawl fisheries. Report on Commission Activities, 1991:81-91. International Pacific Halibut Commission.

Adlerstein, S. 1992. Comparison of day and night bycatch rates in Bering Sea domestic bottom trawl fisheries. Report of Assessment and Research Activities, 1991:211-219. International Pacific Halibut Commission.

Adlerstein, S.A., and R.J. Trumble. 1993. Management implications of changes in by-catch rates of Pacific halibut and crab species caused by diel behaviour of groundfish in the Bering Sea. ICES Marine Science Symposium 196:199-203.



UNITED STATES DEPARTMENT OF COMMERCE
N.O.A.A. / National Marine Fisheries Service
Alaska Enforcement Division
P.O. Box 21668
Juneau, Alaska 99802-1668

February 16, 1993

Mr. David Witherell
North Pacific Fishery
Management Council
P.O. Box 103136
Anchorage, AK 99510

RE: Night Ban On Trawling For Pacific Cod

Dear David,

Thank you for the opportunity to comment on the proposed amendment to prohibit night trawling for Pacific cod in the BS/AI. Although the rationale behind the proposal may be sound, I cannot perceive of any practical way to implement or enforce the proposal short of banning all trawling at night or prohibiting the retention of any Pacific cod taken at night. In the latter case, waste is substantially increased with little or no decrease in removals. Effective enforcement of the retention ban would be difficult at best.

I am presuming that the proposal is to prohibit "directed fishing" for Pacific cod at night. Under current regulations, a directed fishery is defined by our "Directed Fishing Standards". These standards are based on the amount of retained fish during a fishing trip (or weekly reporting period in the case of at-sea processing vessel). These standards do not prohibit a vessel from targeting on any particular bycatch species as long the retained catch of the bycatch species does not exceed a designated percentage of all other retained catch aboard the vessel during the trip. If we are going to pursue the "directed fishing" scenario, all concerned must realize that the regulation will not prohibit targeting on Pacific cod at night and there is virtually no way to prove a violation short of confession. Under our current definition of a trip, I don't believe a violation of this proposal is even identifiable.

For any regulation to be enforced a violation must at least be detectable through one or more standard enforcement or monitoring mechanisms. These being surveillance, boarding and inspection, records auditing, investigations, on board informants, or observer coverage. Effective enforcement is that which results in substantive compliance. Effective enforcement generally only occurs when a violation can be detected by multiple enforcement

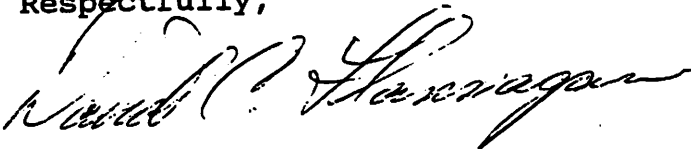


mechanisms and the resources to carry out enforcement and monitoring are sufficient to routinely detect obvious violations. Violations of this proposal cannot be detected through any of our standard enforcement or monitoring mechanisms. Observers and on board informants do not have the practical ability to monitor amounts of retained product. They certainly do not have the ability to adequately account for product retained at night versus all other times of the day. Observer sampling procedures focus on total catch. Even a cod end containing 100% Pacific cod which is retrieved in the dead of night and processed would not constitute a violation of directed fishing standards. Logbooks also provide no means of detecting a violation. Logbooks reflect total retained product for the entire day. They do not address production during any particular segment of the day.

Lastly, I do not believe that the regulation can be remedied by redefining a trip to be that period of time between sundown and sunrise. Production numbers for such a short period of time would be difficult for any vessel to accurately obtain. Record keeping would be greatly exacerbated for the vessel. Further production data for such a short period of time is easily manipulated and almost impossible for enforcement or anyone else to verify.

I have discussed this issue with Capt. Anderson of the 17th CGDIST and he concurs that this proposal is unenforceable. Please contact me if you have any questions or any other thoughts as to how such a ban might be effectively implemented.

Respectfully,



David C. Flannagan
Special Agent in Charge

cc:17CGDIST-B.Anderson
F/AKR-R.Berg
R.Hegge

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GROUND FISH FISHERY MANAGEMENT PLAN AMENDMENT PROPOSAL
North Pacific Fishery Management Council

Name of Proposer: *Midwater Trawler Cooperative*

Date: *1/16/93*

Address: *4055 21st ave W Seattle, WA*

Telephone: *(206) 285-3480*

Fishery Management Plan: *BS/AL Groundfish*

Brief Statement of Proposal:

BAN "Night" trawling for Pacific cod

(Night needs to be defined and options for hours of closures proposed for analysis)

Objectives of Proposal: (What is the problem?)

stop fishing for Pacific cod during periods of time when cod are off the seabed, cod catch rates are the lowest and halibut by-catch rates per ton of cod catch are documented to be abnormally high.

Need and Justification for Council Action: (Why can't the problem be resolved through other channels?)

This action can reportedly occur only by plan amendment

Foreseeable Impacts of Proposal: (Who wins, who loses?)

will move to maximize cod catch per unit of halibut by-catch. Proposal will move to maximize net economic benefit to the nation by increasing total groundfish harvest under fixed halibut cap

Are There Alternative Solutions? If so, what are they and why do you consider your proposal the best way of solving the problem?

No other alternative solutions known. must be solved by regulation

Supportive Data & Other Information: What data are available and where can they be found?

A wealth of data exists which document the validity of this proposal. sources are the NMFS observer program and EPA documents which have already studied this issue

Signature:

Sturtevant, Technical Advisor for MTC

ICES mar. Sci. Symp., 196: 000-000. 1993

Management implications of changes in by-catch rates of Pacific halibut and crab species caused by diel behaviour of groundfish in the Bering Sea

Sara A. Adlerstein and Robert J. Trumble

Adlerstein, S. A., and Trumble, R. J. 1993. Management implications of changes in by-catch rates of Pacific halibut and crab species caused by diel behaviour of groundfish in the Bering Sea. - ICES mar. Sci. Symp., 196: 000-000.

This study compares day and night by-catch rates of prohibited species (ratio of prohibited species to groundfish catch) in US domestic bottom-trawl fisheries for Pacific cod (*Gadus macrocephalus*) and walleye pollock (*Theragra chalcogramma*) in the Bering Sea to identify management options to reduce by-catch. Bottom trawl fisheries in the Bering Sea cause significant by-catch mortality of Pacific halibut (*Hippoglossus stenolepis*) and other prohibited species such as king crab (*Paralithodes camtschatica*) and Tanner crabs (*Chionoecetes* spp.). By-catch rates are higher during night hours than during the day. We propose that by-catch differences are caused by diel vertical migration and other behavioural characteristics of the species that result in fluctuations of their relative abundance near the seabed between the two time periods. Avoiding night bottom fishing in the Pacific cod and walleye pollock fisheries may permit by-catch rate reduction. Fishing exclusively during day hours could produce total savings from 13 to 16% of the observed by-catch of halibut, king crab, and Tanner crabs.

Sara A. Adlerstein and Robert J. Trumble: International Pacific Halibut Commission, PO Box 95009 Seattle WA 98145-2009, USA.

Introduction

By-catch of prohibited species such as Pacific halibut (*Hippoglossus stenolepis*), king crab (*Paralithodes camtschatica*), and Tanner crabs (*Chionoecetes* spp.) in the Bering Sea causes tremendous losses, both in groundfish and in prohibited species fisheries. Management regulations for by-catch in the region set quotas for prohibited species (tonnes of halibut and number of crabs) in the various groundfish fisheries and require prompt discard of the by-catch to the ocean. By-catch quotas are often reached before the groundfish quotas are taken, and these fisheries are closed before their allowances are harvested. Among the bottom trawl fisheries in the region, catches with high proportion of Pacific cod (*Gadus macrocephalus*) experience high halibut by-catch rates. Fishermen have reported that higher by-catch rates occur during night hours than during the day. Variation in these rates is most probably related to the diel vertical migration of Pacific cod. Cod species, usually found in close association with the seabed during

day hours, have been reported to migrate to the surface during the night (Beamish, 1966; Turuk, 1973). The goal of this study is to investigate the reported day and night differences in by-catch rates and to understand the behavioural processes of the various species involved in the fishery to use this information for management purposes. Our approach was statistically to compare fishery data, and to complement the results with biological information on the species' behaviour.

Material and methods

Pacific halibut and crab species by-catch rates vary with the composition of the groundfish species in the catch (i.e. walleye pollock (*Theragra chalcogramma*), Pacific cod, yellowfin sole (*Limanda aspera*), rock sole (*Lepidopsetta bilineata*) and other flatfish) (Berger *et al.*, 1989; Clark, 1990; Adlerstein, 1991). This analysis investigates whether by-catch rates in the Pacific cod and walleye pollock fisheries vary from day to night after

and is an important component of the total catch of Pacific cod and walleye pollock fisheries.

accounting for systematic changes in species composition in the catch. The study uses data from individual bottom trawl hauls from the 1990 domestic operations in the western region of Area 511 in the Eastern Bering Sea (Fig. 1). Pacific cod is part of several bottom-trawl multispecies fisheries, Pacific cod and walleye pollock fisheries are those in which halibut and crab species are an important component of the total catch. Fishing operated in the area from January to May. Pacific cod is also caught by trawls in Areas 513, 517, 519, 521, and 522, but we selected Area 511 because of data availability. Data were provided by the National Marine Fisheries Service (NMFS), Seattle, and are from the NORPAC database generated by a mandatory observer programme. Records contain the weight, numbers, and length frequencies of Pacific halibut, number of crabs, total catch weight, and weight by groundfish species. Records also contain information about trawl operations such as gear type, date, location, and time of set and retrieval of the nets. Day hauls are those set and retrieved between sunrise and sunset, and night hauls are those taken after evening twilight and before morning twilight. Hauls extending from day to night periods were classified as transitional.

Comparison of day and night rates used an analysis of covariance (ANCOVA) (Zar, 1984), where by-catch rates are a function of the catch composition. The analysis used the Generalized Linear Interactive Modelling (GLIM) System (Royal Statistical Society 1987). The proportions of Pacific cod and rock sole in the catch were incorporated as covariates, and month (January to May) and time period of the day were included as fixed factors. Walleye pollock, an important component of the catch, was not included as a covariate because Pacific

cod and pollock are collinearly related in these fisheries (Adlerstein, 1991). Yellowfin sole, another important component of the overall catch, was not included as covariate because it was not part of the domestic fisheries in 1990. Month was used as a fixed factor because by-catch of halibut and crab species experiences temporal variations (Adlerstein, 1991).

Data were subjected to the model $Y_{ij} = \mu + \alpha_i + \beta_j + \alpha\beta_{ij} + b_{1ij}X_1 + b_{2ij}X_2$ where Y is the natural logarithm of the prohibited species by-catch rate + 1 (in kilograms of halibut or number of crabs per tonne of groundfish) for the i th month and the j th time periods, X_1 , and X_2 are the proportions of Pacific cod and rock sole in the catch, and α and β are model intercept parameters for the month and time period modifying the overall mean μ . The logarithmic transformation of the by-catch data normalized the distribution of the errors. We fitted the full model and tested for differences in the model slopes between month and time of the day periods as well as for differences between the means. Applying day parameters of the model together with night catch proportions and comparing the results with estimates obtained from night parameters, we were able to estimate monthly savings of prohibited species by-catch that would be obtained if the night catches of fisheries under consideration were harvested during day hours.

Results

Comparison of the parameter estimates of the three time categories (β_i) in fitting the full by-catch model revealed that by-catch rates of halibut and the crab species in the transition category were not significantly different from the night rates (halibut: $p(|t| \geq 0.816) > 0.2$; king crab: $p(|t| \geq 1.108) > 0.2$; Tanner crab: $p(|t| \geq 0.891) > 0.2$). Thus, for further analysis we combined the transition and night categories. Observed mean by-catch of the combined data for the three prohibited species was higher during night hours (Fig. 2). Results of the ANCOVA using day and night-time categories showed that three-way interactions between Pacific cod, month and day/night periods were not significant at an α level of 0.05 ($F_{4,1370} = 2.152$; $p = 0.072$), nor between rock sole, month and day/night periods ($F_{4,1370} = 1.961$; $p = 0.098$). Two-way interaction between Pacific cod and month was not significant ($F_{4,1378} = 1.846$; $p = 0.118$), nor were the interactions between rock sole and month ($F_{4,1378} = 1.653$; $p = 0.159$), Pacific cod and day/night period ($F_{1,1378} = 2.729$; $p = 0.099$), and rock sole and day/night period ($F_{1,1378} = 2.575$; $p = 0.109$). These results allowed us to perform an ANCOVA (intercepts) using common slopes (b_1 and b_2) models. Results from the ANCOVA indicated that by-catch rates vary by time of the day ($p = 0.004$), by month ($p < 0.0005$), and with the proportion in the catch of Pacific cod ($p < 0.0005$) and rock sole ($p < 0.0005$). The interaction between month and time of the day was not significant ($p > 0.25$)

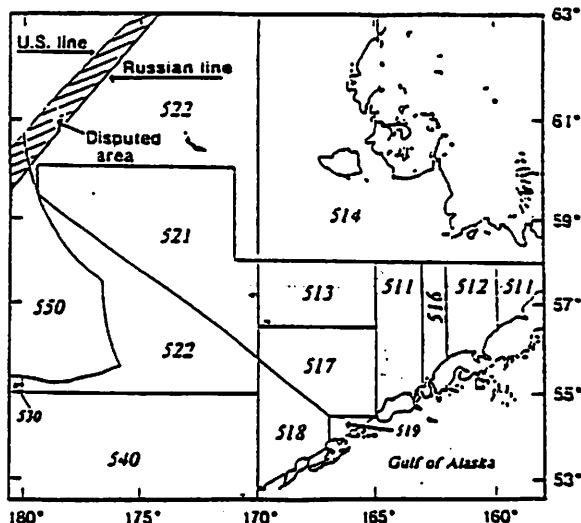


Figure 1. Regulatory areas in the Bering Sea/Aleutian Islands. Data for the analysis were taken from the stippled area of Area 511.

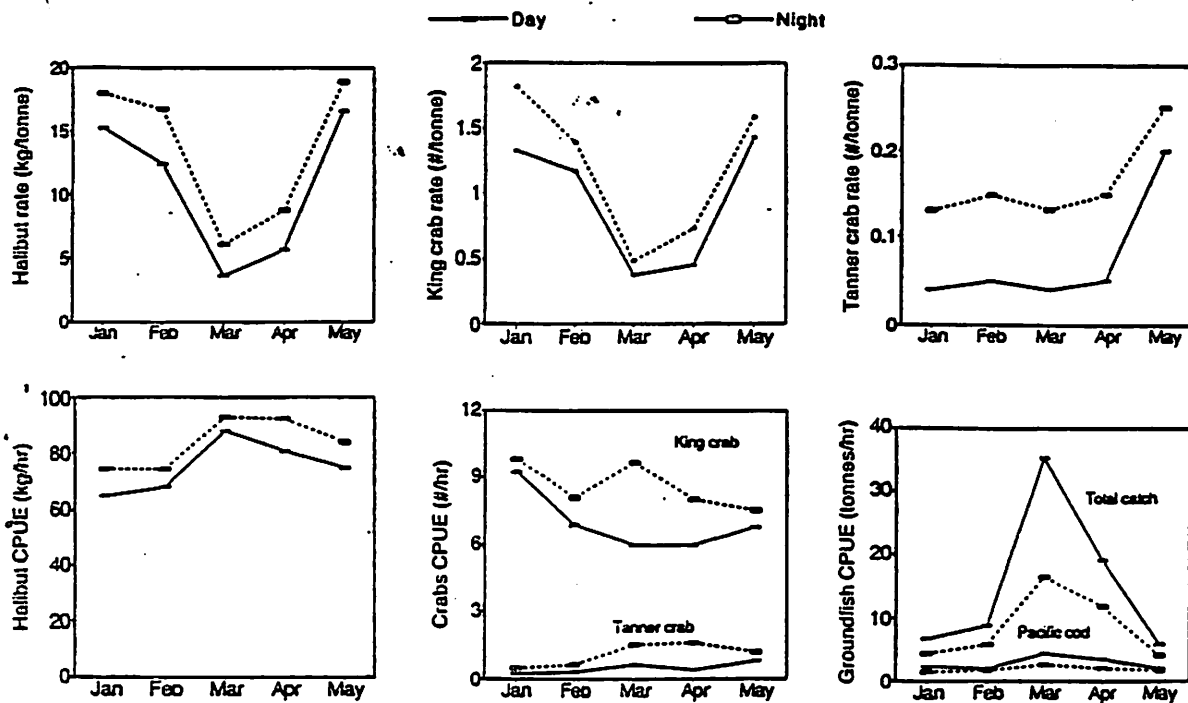


Figure 2. Observed mean by-catch rates of the prohibited species, and catch per hour of groundfish and prohibited species in Area 511, 1990.

(Table 1). A Filliben test (Filliben 1975) performed on the ordered model residuals indicated no evidence against assuming normal distribution of the errors (Filliben coefficient = 0.9989, $p < 0.05$).

Inspection of the parameter estimates of the common slopes model incorporating month, time of the day, and proportions of cod and rock sole, shows that the intercept of the model is increased during night hours over the day intercept (Table 1). Thus, since the slopes remain the same during the two time periods, halibut by-catch rates for a given catch species composition are higher at night than during the day. We estimated potential savings obtained by fishing during day hours by using parameters in Table 1 and catch composition. The results indicated that if night catches were taken during the day, the by-catch rates would be reduced by 16.2% in January, 16.4% in February, 17.4% in March, 35.4% in April, and 15.2% in May.

Results of the ANCOVA on the by-catch data of the two crab species showed similar results to those obtained from the halibut data. Three- and two-way interactions between the covariates and factors were non-significant ($p > 0.1$ in all cases). This allowed us to perform the ANCOVA using common slopes models. Results from ANCOVA on the king crab data using the common slopes model revealed that day and night by-catch rates are significantly different from each other ($p < 0.0005$)

Table 1. Results of analysis of covariance of the by-catch rate (Y) of Pacific halibut for the effect of month (January to April), and time of the day (night and day) accounting for the proportion of Pacific cod (X1) and rock sole (X2). Covariates, factors, and interactions are assessed simultaneously, with each effect adjusted for all other effects in the model.

Source of variation	SS	DF	F	P
Month	178.80	4	43.525	<0.0005
Day/night	8.44	1	8.173	<0.004
Rock sole	61.37	1	61.367	<0.0005
Cod	87.02	1	87.016	<0.0005
Month, day/night	2.613	4	0.635	>0.25
Residual	1426.8	1389		

Parameter estimates for the model including significant variables $Y_{ij} = \mu + \alpha_i + \beta_j + b1X1 + b2X2$

	Estimate	s.e.	Parameter
1	1.680	0.1003	μ (January, day)
2	-0.2956	0.1017	α_2 (February, day)
3	-0.6809	0.1124	α_3 (March, day)
4	-0.3854	0.0983	α_4 (April, day)
5	0.3978	0.0911	α_5 (May, day)
6	0.1659	0.0578	β_2 (night)
7	2.047	0.2555	Rock sole (covariate) (b1)
8	1.189	0.1232	Pacific cod (covariate) (b2)

α_1 and β_1 are constrained to 0. Standard errors of the intercept α_i and β_j are of the difference between the corresponding factor levels and μ .

Handwritten note: μ and α_3 are circled. A note says "Parameter values 2, 3, and 4 are negative." with a question mark.

and that the night intercept is increased over the day intercept. All other variables were significant in determining by-catch ($p < 0.0005$). We estimated rate reductions as before. Rates could be reduced by 17.2% in January, 20.8% in February, 28.7% in March, 26.4% in April, and 19.0% in May. Results from the ANCOVA using the reduced model on the Tanner crab data indicated that day and night by-catch rates are significantly different from each other ($p < 0.005$) and that the night intercept is increased over the day intercept. We estimated rate reductions to be 31.9% in January, 34.9% in February, 37.7% in March, 34.4% in April, and 39.4% in May.

By-catch rates are determined by the relative abundance of prohibited species and groundfish in the catch. Catch per unit effort (c.p.u.e. in tonnes/h) of groundfish decreases significantly at night: $p(|t| \geq 2.724) < 0.005$ for all month (Fig. 2). In particular c.p.u.e. of Pacific cod decreases during the night: $p(|t| \geq 1.953) < 0.05$ for all month. Lower c.p.u.e. of the groundfish catch during night suggests that fish are less available or vulnerable to the net near the seabed during those hours. Lower availability is consistent with hydroacoustic observations in the Bering Sea that the two main species in the catch, Pacific cod and walleye pollock, rise off the bottom during the night (E.P. Nunnallee, pers. comm., NMFS, Seattle). Also, catch rates of cod (*Gadus morhua* L.) in bottom trawl surveys have been reported to be higher by day (Engas and Soldal, 1992). Halibut, king and Tanner crabs, c.p.u.e. by month are consistently higher at night (Fig. 2), although the differences between the two time periods are not significant ($p(|t| \geq 0.543) > 0.5$; $p(|t| \geq 1.528) > 0.1$; $p(|t| \geq 1.679) > 0.1$). Higher c.p.u.e. can be due to increased vulnerability or availability of prohibited species near the seabed during night hours. We observed that length frequency distributions of halibut by-catch during day and night hours show significant differences (Kolmogorov-Smirnov two-samples test p of $Z < 0.0001$). The tendency is to find higher proportions of fish larger than 50 cm in night hauls than in day hauls. It is possible that fish vulnerability changes between dark and light periods because large halibut are more likely to avoid the nets during light periods. No information was accessible to us to investigate diel changes in availability. Nevertheless, Walsh (1991) reported no evidence of changes of availability of American plaice or yellowtail flounder in relation to light intensity. The variation of the crab species c.p.u.e. between day and night periods may be due to differences noted in behaviour between a period of diurnal rest and one of nocturnal foraging, as noted by Dew (1989) in king crabs. Nocturnal aggregations result in pods, which are accumulations of several hundred to several thousand crabs. It is conceivable that nocturnal activity may increase availability compared with the day situation when crabs are resting in a hiding site.

Discussion and conclusion

By-catch rates of prohibited species in the walleye pollock and Pacific cod bottom trawl fisheries in the Bering Sea were found to be higher during the day than during night hours. Increase in halibut and crab by-catch rates at night is probably the result of the behaviour of the species involved in the bottom trawl fisheries. The relative abundance of the groundfish (mainly walleye pollock and Pacific cod) on bottom decreases during the night, seemingly because species migrate towards the surface during the night. Observations of cod migrating to midwater at night (i.e. Beamish, 1966; Turuk, 1973) support this hypothesis. However, movement in the opposite direction has also been observed. Turuk (1973) demonstrated that the direction of the migration is related to the cod diet: when feeding on actively swimming prey, cod descend during the day and ascend at night; if benthic organisms predominate in the diet the opposite is true. Although Pacific cod diet exhibits much diversity, in the study area this species feeds primarily on pelagic fish such as juvenile pollock (Brodeur and Livingston, 1988).

Prohibited species' c.p.u.e. are consistently, although not significantly, higher at night. Higher halibut c.p.u.e. in kg h^{-1} is related to higher proportion of large fish in night catches. We speculate that during the day large fish are more likely to avoid the nets. This is in agreement with the suggestion that vision is the predominant sense used in avoidance reaction when a fish is approached by a trawl (Wardle, 1986). Walsh (1991) demonstrated higher escapement of large flounders (plaice and yellowtail) under the groundgear during the day than during night hours. The night increase in crab c.p.u.e. is consistent with observations of crab podding activity. Dew (1989) reported on diel activity cycles and foraging dynamics of king crab in the general area of this study. We propose that high catch rates at night are generated by fishing when crabs are active and highly aggregated.

Irrespective of the origin of differences in by-catch rate, it is clear that savings may be obtained in the fisheries considered in this study by avoiding fishing during dark hours. Avoiding night fishing may extend the groundfish fishing seasons and increase the harvest of their allowances. From the NORPAC data and information provided by Jerry Berger (pers. comm., NMFS, Seattle), we estimated that for Area 511 the total harvest for Pacific cod and walleye fisheries and the total halibut by-catch are around 50 000 and 500 tonnes respectively. This is about 10% of the entire bottom trawl harvest and halibut by-catch of the Bering Sea. Based on the data from the 1990 fishing season in Area 511, day-only fishing can reduce total halibut by-catch by 13%. Conversely, for the same amount of by-catch taken in the area, day fishing would allow 13% more of the groundfish harvest. Day-only fishing would result in 13% sav-

ings of king crab by-catch in numbers, and 16% savings of Tanner crabs. In many instances a change in management strategies designed to protect a particular prohibited species, such as imposing fishing seasons or closing specific areas to harvest, can be to the detriment of other prohibited species. Day-only fishing in the Bering Sea of the fisheries considered, however, appears to reduce concurrently the by-catch rates of Pacific halibut, king crab, and Tanner crabs.

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APRIL 1993



UNITED STATES DEPARTMENT OF THE INTERIOR
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

April 14, 1993

Mr. Richard B. Lauber
Chairman, North Pacific Fishery
Management Council
P.O. Box 103136
Anchorage, Alaska 99510

Dear Rick,

Standard bycatch rate standards for the vessel incentive program trawl fisheries during the second half of 1993 are scheduled to be published in the Federal Register by June 1, 1993. A summary of 1991, 1992, and 1993 data on fishery bycatch rates is listed in the attached table. At its December 1992 meeting, the Council also was provided a series of graphs showing the distribution of observed bycatch rates. The Council may wish to review these data when recommending halibut and red king crab bycatch rate standards for the second half of 1993.

Sincerely,

Steven Pennoyer
Director, Alaska Region



1991 - 1993 observed bycatch rates, by quarter, of halibut and red king crab in the fishery categories included in the vessel incentive program. Bycatch rate standards for the first half of 1993 (QT 1 and QT2) and the second half of 1992 (QT 3 and QT4) also are listed.

Halibut Bycatch (Kilograms Halibut/ MT Allocated Groundfish Catch)

Fishery and quarter	Bycatch Rate Standards	Observed Bycatch Rates		
		1991	1992	1993
BSAI Midwater Pollock				
QT 1	1.0	0.05	1.40	0.98
QT 2	1.0	0.17	0.73	
QT 3	1.0	0.55	0.50	
QT 4	1.0	****	0.40	
Year to date		0.23	0.87	
BSAI Bottom Pollock				
QT 1	7.5	14.30	7.58	7.62
QT 2	5.0	8.27	4.34	
QT 3	5.0	1.89	2.31	
QT 4	5.0	0.00	0.29	
Year to date		4.13	5.64	
BSAI Yellowfin sole (in 1991, includes 'other flatfish')				
QT 1	5.0	5.38	****	****
QT 2	5.0	2.45	3.40	
QT 3	5.0	7.17	3.71	
QT 4	5.0	2.99	5.52	
Year to date		5.06	4.02	
BSAI Other Trawl Fisheries				
QT 1	30.0	13.82	12.20	8.74
QT 2	30.0	20.04	16.25	
QT 3	30.0	10.90	4.81	
QT 4	30.0	30.10	0.94	
Year to date		16.24	12.83	
GOA Midwater Pollock				
QT 1	1.0	0.05	0.11	0.01
QT 2	1.0	0.03	0.06	
QT 3	1.0	0.18	0.03	
QT 4	1.0	0.89	0.35	
Year to date		0.41	0.11	
GOA Other Trawl fisheries				
QT 1	50.0	23.96	19.75	32.11
QT 2	50.0	65.91	22.08	
QT 3	50.0	23.59	24.14	
QT 4	50.0	26.33	26.85	
Year to date		31.07	21.95	

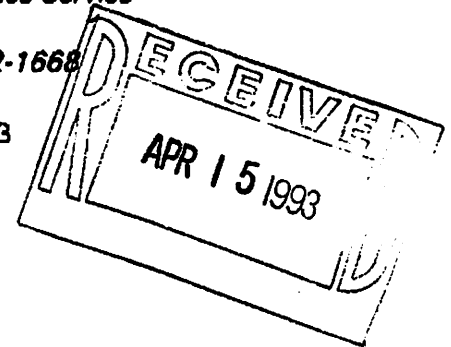
Zone 1 Red King Crab Bycatch Rates
(number of crab/mt of allocated groundfish)

BSAI yellowfin sole (in 1991, includes 'other flatfish')				
QT 1	2.5	1.31	****	****
QT 2	2.5	1.44	1.34	
QT 3	2.5	0.00	0.00	
QT 4	2.5	****	****	
Year to date		1.27	1.34	
BSAI Other Trawl				
QT 1	2.5	0.93	1.19	2.47
QT 2	2.5	0.02	1.72	
QT 3	-	0.00	0.00	
QT 4	-	****	****	
Year to date		0.78	1.21	



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

April 15, 1993



Mr. Richard B. Lauber
Chairman, North Pacific Fishery
Management Council
P.O. Box 103136
Anchorage, Alaska 99510

Dear Rick,

Regulations governing the practice of pollock "roe-stripping" were implemented in 1991. The intent of these regulations is to limit the practice of pollock roe-stripping to the extent practicable under authority of Amendments 14 to the Fishery Management Plan (FMP) for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area and Amendment 19 to the FMP for Groundfish of the Gulf of Alaska. Since these regulations were implemented, we have become aware of several "loopholes" that undermine the intent of these regulations. Only a limited number of vessels have taken advantage of these loopholes to date, but we expect more vessels to do so in the future.

We recommend that a proposed rule be prepared that would prevent activities that are contrary to the intent of regulations governing pollock roe stripping. At this time, we believe this rulemaking would be categorically excluded from National Environmental Protection Act requirements to prepare an environmental assessment because the proposed changes would be within the scope of alternatives addressed in the environmental assessment prepared for Amendments 14 and 19. Our ability to use a categorical exclusion would facilitate our ability to submit a proposed rule in a timely manner. Provided the Council concurs with the approach we intend to pursue, further Council consideration of the proposed changes would not be required.

Proposed regulatory changes to 50 CFR parts 672 and 675 and the reasons for them follow. Proposed regulatory revisions are underlined.

1. Change the definition of "fishing trip" at § 675.20(j)(4) to read as follows:

(4) Fishing trip. For purposes of this paragraph, a vessel is engaged in a fishing trip when commencing or resuming the harvesting, receiving, or processing of pollock until: (i) the transfer or offloading of all pollock product; (ii) the vessel leaves the subarea where fishing activity commenced; or, (iii) the end of a weekly reporting period, whichever comes first.

The intent of these changes are to: (1) limit the ability of vessel operators to top off the end of a lengthy fishing trip with roe product to maximize the allowable amount of roe retained during a trip (i.e., engage in roe-stripping activity); and, (2) prevent a vessel operator from partially offloading some pollock product, but retaining other pollock product, such as roe, during a trip. These practices potentially undermine the intent of regulations to limit the practice of roe-stripping and severely confound enforcement of allowable retention amounts of roe relative to primary pollock product onboard a vessel.

2. Add a new paragraph at §§ 675.20(j)(6) and 672.20(i)(6) to read as follows:

(6) Any primary pollock product used to calculate retainable amounts of pollock roe under paragraph (j)(5) [or (i)(5)] of this section: (i) must be processed for long term storage by the vessel retaining the pollock roe prior to any transfer of the product to another vessel; and, (ii) may not be subsequently discarded at sea.

The intent of the new paragraph would be to prevent vessel operators from using "unprocessed" pollock as primary product to calculate retainable amounts of roe or discarding any primary pollock product at sea that was used to calculate retainable amounts of roe.

3. Revise paragraphs 675.20(j)(1) and 672.20(i)(1) to define the term "pollock roe" and to prohibit using primary roe-related product such as "headed and gutted with roe" to calculate retainable amounts of roe only product (product code 14).

(1) For purposes of this paragraph, pollock roe means product comprised of pollock eggs, either loose or in sacs or skeins. Only one primary product per fish, other than pollock roe, may be used to calculate the round weight equivalent. A pollock product that contains roe (such as headed and gutted pollock with roe) may not be used to calculate round weight equivalent of retained pollock. * * *

The above three regulatory changes would affect only those vessel operations that have circumvented regulatory intent and practice roe-stripping operations to the extent possible under existing regulatory loopholes. In general, the above changes would not result in additional constraints on vessel operations beyond those already intended under regulations governing pollock roe-stripping. If the Council concurs with our recommended changes,

we will submit a proposed rule for Secretarial review and approval. If approved, we intend the revised regulations to be effective by the 1994 fishing year.

Sincerely,



Steven Pennoyer
Director, Alaska Region

DRAFT ENVIRONMENTAL ASSESSMENT/REGULATORY IMPACT REVIEW/INITIAL

REGULATORY FLEXIBILITY ANALYSIS

**FOR THE EXPANSION OF SEASONAL 20 NM GROUND FISH TRAWLING
PROHIBITIONS AROUND 6 STELLER SEA LION ROOKERIES TO INCLUDE
NOVEMBER/DECEMBER TARGET POLLOCK FISHERIES**

**Prepared for:
The North Pacific Fishery Management Council**

**Prepared by:
National Marine Fisheries Service
Alaska Regional Office**

April 16, 1993

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**DRAFT ENVIRONMENTAL ASSESSMENT/REGULATORY IMPACT REVIEW/
INITIAL REGULATORY FLEXIBILITY ANALYSIS
FOR THE**

**EXPANSION OF SEASONAL 20 NM GROUND FISH TRAWLING PROHIBITIONS
AROUND 6 STELLER SEA LION ROOKERIES TO INCLUDE
NOVEMBER/DECEMBER TARGET POLLOCK FISHERIES**

1.0 INTRODUCTION

This environmental assessment/regulatory impact review/initial regulatory flexibility analysis (EA/RIR/IRFA) was prepared to examine the impacts of a proposed regulatory amendment, under the authority of the Bering Sea/Aleutian Islands (BSAI) Groundfish Fishery Management Plans (FMP). The proposed action is intended to minimize the potential adverse effects of Federally managed groundfish fisheries on the Steller sea lion (Eumetopias jubatus), a species listed as threatened under the Endangered Species Act (ESA). This EA considers three alternatives: (1) no action; (2) expansion of the seasonal 20 nm no trawl zones around Steller sea lion rookeries at Sea Lion Rocks, Akun, Ugamak, Akutan, Agligadak Island and Seguam to November and December when significant pollock harvest is forecasted for these months or (3) establish a directed pollock fishery closure date of November 1 to prevent an increase in winter harvest. The National Marine Fisheries Service's (NMFS) preferred action is Alternative 2.

1.1 Purpose of and Need for the Action

Because of a precipitous population decline, NMFS listed the Steller sea lion as a threatened species under the Endangered Species Act (November 26, 1990; 55 FR 49204). Extensive declines have been noted in the Russian, Aleutian Islands, Bering Sea, and Gulf of Alaska portions of the Steller sea lion's range. The precise causes of the observed decline are not known. Hypothesized causal factors include natural or anthropogenic changes in the Steller sea lion food base, intentional killing, incidental take in fishing gear, disturbance at rookeries and haulouts due to fishing activity, disease and predation.

The BSAI groundfish fishery has developed in the geographic area that has historically supported the bulk of the Steller sea lion population. This geographic region has experienced substantial declines in the number of Steller sea lions counted on breeding sites over the last 30 years. Although the relationship between the Steller sea lion population and the BSAI groundfish fishery is unclear, Steller sea lions are incidentally taken in fishing gear and may compete with commercial fisheries for food

resources. Trawl fisheries are suspected to be especially competitive for Steller sea lion prey resources due to both the species targeted and the ability of trawls to catch concentrated patches of fish. Mid-water trawl fisheries, such as the pollock fishery, may particularly affect juvenile sea lions due to their ability to capture fish within the water column at depths accessible to juveniles. Regardless of the actual cause of the decline in this threatened population, modifications of fishing practices were considered one of the few mechanisms available that would lessen human impacts on Steller sea lions and promote the recovery of the population. Regulations, discussed below, were implemented based upon the best available information to curtail the continued decline of the Steller sea lion population. It is likely that regulations will be modified as new information on Steller sea lions is received.

On January 23, 1992 NMFS issued a rule that prohibited groundfish trawling within 10 nm of all BSAI and GOA Steller sea lion rookeries with a seasonal expansion, during the pollock roe ("A") season, to 20 nm around Sea Lion Rocks, Akun, Akutan, Agligadak and Seguam (57 FR 2683). These restrictions were intended to reduce the likelihood that commercial groundfish removals would deplete Steller sea lion prey abundance in key foraging areas in the Aleutian Islands and the eastern Bering Sea shelf, as well as to reduce incidental and intentional takes of Steller sea lions. While mid-water trawls were considered most competitive for sea lion forage species, the degree of uncertainty regarding the potential affect of bottom trawls and the need for effective enforcement of the regulation necessitated a prohibition of all trawl gear within the zone while directed pollock fishing occurred during the "A" season. NMFS evaluated the BSAI groundfish harvest data and identified a trend towards increased harvests in the vicinity of important BSAI Steller sea lion rookeries, and an increase in the proportion of the catch taken during the first half of the year when sub-adult sea lions may be nutritionally deprived and environmentally stressed. From NMFS's evaluation, it also appeared likely that the 1992 closure of the Bogoslof District to directed fishing for pollock would further concentrate the winter harvest onto the southeastern Bering Sea shelf near sea lion rookeries.

The eastern Aleutian Islands' portion of the Steller sea lion's range, within the Bering Sea management area, has experienced drastic population declines - about an 80% reduction since the 1970's. Further concentration of fishing effort in this area during the winter pollock fishery could adversely affect the ability of Steller sea lions to forage. Steller sea lions are thought to be especially sensitive to stress during the late fall and winter due to limited alternative prey availability, severe

weather conditions, and initiation of weaning and gestation. Seasonal 20 nm no-trawl zones were expanded to include the rookery on Ugamak Island on March 12, 1993 after satellite telemetry data confirmed historical information regarding the importance of the Bering Sea shelf to sea lions, which act as one group in that area (58 FR 13561).

At their January 1993 meeting, the North Pacific Fishery Management Council (NPFMC) voted to delay the start of the BSAI pollock "B" season from June 1 to August 15 of each year. This delay was proposed to allow individuals participating in the pollock fishery to: (1) maximize product recovery by delaying harvest to a time period when pollock flesh quality is better, and (2) participate in other fisheries. A proposed rule to implement the NPFMC's recommendations was published in the Federal Register for a 15 day public comment period on April 1, 1993 (58 FR 17200).

The delay of the "B" season may cause pollock harvest operations to extend into the early winter months on the southeastern Bering Sea shelf near Steller sea lion rookeries/haulouts. Available fishery data indicate that the "B" season is generally prosecuted in approximately 6 weeks. The offshore and inshore component pollock fisheries likely will harvest allocated amounts of pollock before November. Significant harvest of pollock under the CDQ programs also are unlikely during the late fall-early winter period considered critical for Steller sea lions. Unforeseen circumstances, however, could result in unanticipated increases in pollock harvest into November and December. The ability to take in-season action to expand the seasonal trawl closures if significant pollock harvest is expected to extend into November would prevent potentially detrimental affects on the survival and recovery of Steller sea lions dependent on this region while allowing the groundfish fishery to continue in a manner that would not have a significant impact on the human environment, as required by the National Environmental Policy Act of 1969 (NEPA). Although currently, there is no pollock harvest in the AI in November/December, Seguam and Agligadak are included in this assessment due to their need for similar protective measures in the event that pollock harvests are forecasted in those months.

This EA/RIR/IRFA evaluates the biological, environmental, social and economic impacts of the alternatives considered to address the potential impact of the "B" season delay on Steller sea lions. The preferred alternative would extend seasonal 20 nm sea lion protection zones around 6 Steller sea lion rookeries during the months of November and December when significant pollock harvest occurs during those months. The Eas prepared for the

proposed delay of the pollock "B" season, Amendments 20 and 25 to the BSAI and GOA FMPs and the regulatory amendment extending seasonal trawl prohibitions to include the Ugamak Island rookery, contain much of the supporting information for this action and are incorporated herein by reference.

1.2 Alternatives Considered

Alternative-1 - No Action: Under this alternative, the "B" Season delay would be implemented without additional Steller sea lion conservation measures. Existing prohibitions against groundfish trawling within 10 nm of all BSAI and GOA Steller sea lion rookeries year-round and within 20 nm of Akun, Akutan, Ugamak, Sea Lion Rock, Agligadak, and Seguam Islands during the BSAI pollock "A" season would remain in effect. Extension of 20 nm trawl closures in November and December would not be required.

Alternative 2 - Extension of 20 nm trawl closures to November and December when "significant" levels of pollock are expected to be harvested in those months. Under this alternative the existing trawl prohibitions around Steller sea lion rookeries would remain in effect, and trawl closures around Akun, Akutan, Ugamak, Sea Lion Rock, Agligadak and Seguam Steller sea lion rookeries would be extended to 20 nm by in-season action when "significant" directed fishing for pollock is expected during those months.

For the purposes of this action, "significant" amounts will be considered 71,500 mt of pollock in the Bering Sea, or the equivalent of 10% of the "B" season TAC including the CDQ and reserves. This represents approximately 1 week of fishing at current effort. While the acceptability of this level of effort is not based upon an empirical analysis of biological data, it is consistent with previous harvest levels and will afford protection to sea lions in the late fall and winter.

In the AI, 15% of the total TAC, or approximately 7,160 mt of pollock harvest would be considered significant. Again, this represents 1 week of average fishing effort and is set as an acceptable standard on the assumption that a low level of pollock harvest in the Fall will not impede Steller sea lion's ability to forage.

Thus, if 10% or more of the BS "B" season TAC remains to be harvested after November 1, groundfish trawling would be prohibited within 20 nm of the Steller sea lion rookeries at Akun, Ugamak, Akutan and Sea Lion Rock. If 15% or more of the total AI TAC remains to be harvested after November 1, groundfish trawling would be prohibited within 20 nm of the Steller sea lion rookeries at Seguam and Agligadak. These extended trawl

prohibitions would remain in affect until the pollock TAC has been harvested.

The coincidental stresses on sea lions in winter months, including severe weather conditions, weaning of pups, early gestation, low prey diversity, compel consideration of additional measures to mitigate the effects of human activities on Steller sea lions during the late fall and winter months. While the date of onset of the adverse effects of winter stresses cannot be precisely defined, available information suggests that blastocyst implantation has occurred by November, gestation has begun, weaning has been initiated for some pups, and severe weather patterns are established in the BSAI.

Alternative 3 - Establish a BSAI "B" season directed pollock fishery closure date of November 1. Under this alternative, existing prohibitions against groundfish trawling within 10 nm of all BSAI and GOA Steller sea lion rookeries year-round and within 20 nm of Akun, Akutan, Ugamak, Sea Lion Rock, Agligadak, and Seguam Islands during the BSAI pollock "A" season would remain in effect and directed pollock fishing in the BSAI would be prohibited after November 1.

2.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

The effects of the BSAI groundfish fishery on food availability to Steller sea lions is not precisely known. Comparison of the benefits that the following alternatives would confer to Steller sea lions is therefore difficult. The simplistic approach taken here considers that Steller sea lions require special protection in winter months, and larger no-trawl zones that better encompass the sea lion's foraging range and redistribute a greater proportion of the catch away from sea lion habitats will decrease the risk that groundfish fishing will diminish local fish abundance and reduce food availability to Steller sea lions.

2.1 Environmental Impacts of Alternative 1 - No Action

Under this alternative, the fishery would operate under the proposed management regime, in which the pollock "B" season in the BSAI will open on August 15 without seasonal trawl closures beyond the existing 10 nm no trawl zones around Steller sea lion rookeries. A full description of the expected environmental impacts of Alternative 1 is contained in the EA prepared for the proposed delay of the pollock "B" season in the BSAI (NPFMC, February 2, 1993). The following summarizes the conclusions of that EA:

2.1.1. Endangered, Threatened and Candidate Species

Listed and candidate species that may be present in the BSAI are discussed in detail in the EA/RIR/IRFA conducted on the 1993 Total Allowable Catch Specifications for the BSAI and the "B" Season Delay.

Endangered whales in the BSAI are not expected to be affected by this action. Steller sea lions may be impacted by Alternative 1. Available fishery data indicate that the "B" season is generally prosecuted in approximately 6 weeks, and therefore under the new "B" season calendar, would likely be finished by mid October. However, unanticipated delays could result in a directed fishery for pollock into November on the southeastern Bering Sea shelf. A directed winter fishery for pollock could have detrimental affects on the survival and recovery of Steller sea lions dependent on pollock.

Winter stresses, including reduced prey availability, severe weather, initiation of gestation and of weaning are sufficient to merit extra protection for Steller sea lions during this season.

Although there are no fishery management changes proposed in the Aleutian Island (AI) subarea, future pollock harvest in that area in November and December would have similar detrimental effects on sea lions due to reduced prey availability, severe weather conditions, gestation and weaning.

Listed species of salmon, including the Sacramento River winter-run chinook salmon and Snake River sockeye salmon, fall chinook and spring/summer chinook salmon may be present in the BSAI. An informal consultation conducted on effects of the BSAI and GOA groundfish fisheries, including the "B" season delay concluded that the continued operation of these fisheries would not adversely affect listed species of salmon.

Endangered, threatened, proposed and candidate species of seabirds that may be found within the regions of the BSAI where the groundfish fisheries operate, and potential impacts of the groundfish fisheries on these species are discussed in the Environmental Assessment prepared for the BSAI groundfish 1993 TAC specifications. USFWS, in the informal consultation on the 1993 specifications, concludes that groundfish operations are likely to result in an unquantified level of mortality to short-tailed albatrosses, a listed species, but will not jeopardize the continued existence of the population. The take level was not expected to exceed that considered in the USFWS consultation conducted on the implementation of the Marine Mammal Exemption Program. Alternative 1 is not expected to affect any proposed,

candidate or listed seabirds in a manner not already considered in previous consultations.

2.1.2. Marine Mammals

Harbor seals are present in the BSAI and recent information indicates that their numbers are declining. Under Alternative 1, impacts similar to those discussed for Steller sea lions could be expected.

2.2 Environmental Impacts of Alternative 2 - Extension of 20 nm trawl closures to November and December when "significant" levels of pollock are expected to be harvested in those months. Under this alternative the existing trawl prohibitions around Steller sea lion rookeries would remain in effect, and trawl closures around Akun, Akutan, Ugamak, Sea Lion Rock, Agligadak and Seguam Steller sea lion rookeries would be extended to 20 nm by in-season action when "significant" directed fishing for pollock is expected during those months. For the purposes of this action, "significant" amounts will be considered 71,500 mt of pollock in the Bering Sea, or the equivalent of 10% of the "B" season TAC including the CDQ and reserves. In the AI, 15% of the total TAC, or approximately 7,160 mt of pollock harvest will be considered significant. Again, this represents 1 week of average fishing effort. The 20 nm trawl prohibitions would remain in effect until the pollock TAC has been harvested.

2.2.1 Fish Stocks

Alternative 2 provides a mechanism for expanding the seasonal 20 nm no-trawl zones around some Steller sea lion rookeries to include November and December when necessary. It is unlikely that such an expansion will be necessary, therefore no affects to fish stocks or their harvest are actually expected. In the event that the closures are necessary, no change in the total amount of pollock harvested is expected. However, the amount and composition of the bycatch (non-target fish species and juvenile size classes of target species) could be affected by changes in fishing locations. No significant changes in bycatch can be predicted, nor are they expected due to the proposed closure.

In recent years, there have been no significant Fall trawl fisheries that would be affected by the expansion of the no-trawl zones during November and December. NPFMC is considering a proposal to reapportion the Pacific cod TAC between gear types and may increase the harvest of cod (by trawl gear) in the fall and early winter. Until the assessment of that action is complete, however, the affects of seasonal closures on the cod harvest cannot be estimated. Redistribution of trawl fishing effort would be necessary due to the closed area. Any changes in

bycatch patterns related to other fisheries are expected to be minor and to have no effect on fish stocks.

2.2.2 Endangered, Threatened and Candidate Species

Endangered whales are not expected to be affected by Alternative 2. The purpose of this alternative is to afford greater protection to Steller sea lions. Most of the data on proximate causes of the Alaska sea lion decline point to reduced juvenile survival as a significant causative agent. There also are indications that decreased juvenile survival is due to a lack of food post weaning and during the winter/spring of the first year (e.g., smaller sizes at age beginning as early as age 1). The limited data available on juvenile sea lion foraging supports the plausibility of this food limitation hypothesis. Juvenile sea lions appear to be less adept foragers (e.g., they do not and perhaps cannot dive as deep as adults), and may have a more restricted diet (fewer species of prey and smaller prey). Therefore, if the sea lion decline is due to decreased juvenile survival due to a lack of prey, the problem is likely related to a lack of small fish (e.g., 25 cm or less).

Data from sea lion tracking studies and fish surveys indicate that the eastern Bering Sea shelf is probably an important feeding area for Steller sea lions in the eastern Aleutian Islands, particularly for juveniles whose foraging depth range and prey appear more limited than adults. Most trips by juvenile sea lions tagged in the eastern Aleutian Islands in the winter of 1992 were within the boundaries of the 20 nm zone around the Akun, Akutan and Ugamak rookeries. Preliminary data from winter 1992 NMFS hydroacoustic surveys indicate that there were dense, midwater aggregations of small pollock on the Bering Sea shelf. Conversely, pollock aggregations east of 164°45'W on the shelf generally comprised of large fish, oriented on or near the bottom. Presumably, smaller, midwater fish provide a more attainable food source for young sea lions.

The proposed closed areas will further reduce the amount of fish, including bycatch, harvested in areas that appear to be particularly important for Steller sea lion foraging. Decreased fishing effort may improve sea lion foraging success and will reduce interactions between sea lions and fishing vessels/gear. Increased juvenile survival may be attained, which would aid recovery of the species.

No impacts to listed species of salmon beyond those being considered in an ongoing formal consultation on the BSAI groundfish fisheries are expected due to this alternative. Additionally, Alternative 2 is not expected to impact listed or candidate species of seabirds in any manner not already

considered in the informal Biological Opinion conducted on the 1993 TAC Specifications.

2.2.3 Marine Mammals - Harbor seals that forage within the trawl closure areas may benefit from Alternative 2. No other species of marine mammal is expected to be affected by this alternative.

2.3 Environmental Impacts of Alternative 3 - Establish a BSAI directed pollock fishery closure date of November 1. This action would close the entire BSAI management area to directed pollock fishing, regardless of the amount of TAC remaining to be harvested after November 1.

Alternative 3 encourages the concentrated nature of the pollock trawl fishery in the BS by legislating the catch of the entire "B" season TAC to the period between August 15 and November 1. Additionally, CDQ fisheries, which do not by themselves harvest a significant amount of pollock in a manner expected to cause localized depletion of fish stocks, would be restricted under this alternative.

2.3.1 Fish Stocks

Alternative 3 would insure the concentration of the pollock fishery to the period between August 15 and November 1. Most of the pollock TAC is expected to be harvested during this time period under the proposed management regime. Pollock CDQ fisheries, however, which are expected to harvest fish at low levels through December, would either be forced into the more concentrated fishing season, or forego the harvest of a portion of their pollock quota. The pollock CDQ is relatively small (7.5% of the pollock TACs) and the fishery is generally prosecuted in a manner that spreads fishing effort over time and area, preventing localized depletion of fish stocks.

2.3.2 Endangered, Threatened and Candidate Species

The discussion of environmental impacts of Alternative 2 described concerns regarding the perceived importance of providing additional conservation measures to protect Steller sea lion forage species proximal to rookeries during the non-breeding season in the BS. Alternative 3, by restricting directed pollock fishing after November 1 will further reduce the amount of fish, including bycatch, harvested from the Bering Sea shelf in November and December. While this may benefit Steller sea lions during those months, a "B" season closure on November 1 will perpetuate the temporal concentration of the pollock harvest. Thus far, sea lion conservation measures have attempted to spread the pollock fishery over time or area to reduce the potential for localized depletion of any fish stocks. A November 1 closure

would be legislating the concentrated nature of the pollock harvest.

No impacts to listed species of salmon beyond those being considered in an ongoing formal consultation on the BSAI groundfish fisheries are expected due to this alternative. Additionally, Alternative 3 is not expected to impact listed or candidate species of seabirds in any manner not already considered in the informal Biological Opinion conducted on the 1993 TAC Specifications.

2.3.3 Marine Mammals

Harbor seals may be impacted by Alternative 3 in a manner similar to Steller sea lions. No other species of marine mammal is expected to be affected by this alternative.

2.4 Conclusions

Under Alternative 2, the ability to implement expanded 20 nm no-trawl zones around Akun, Akutan, Ugamak and Sea Lion Rock rookeries in the event that significant levels of pollock TAC are available to be harvested after November 1 will provide mitigation of the potential effects of human activities on Steller sea lions during winter months. These rookeries abut the eastern Bering Sea shelf, which appears to be an important winter foraging area for Steller sea lions. Mitigation of potential fishery effects in November and December is necessary due to the numerous coincidental stresses on sea lions in winter months, including severe weather conditions, weaning of pups, early gestation, low prey diversity. This action may result in an increase in transportation costs due to the redistribution of vessels trawling for pollock and cod during winter months.

2.4.1 Endangered Threatened and Candidate Species

Section 2.2.2 presents the possible effects of the preferred alternatives on listed species. Steller sea lions are expected to benefit from the Alternative 2 or 3. Under all of the alternatives, listed species of seabirds would not be adversely affected in any manner that has not been considered in previous Section 7 consultations with the USFWS. Listed species of Pacific salmon would not be adversely affected in any manner that has not been considered in the informal Section 7 consultation conducted on the 1993 BSAI and GOA Groundfish Management Plans and the proposed delay of the "B" season [Insert Date]. No further consultation pursuant to Section 7 of the ESA is required.

2.4.2 Marine Mammal Protection Act

Harbor seals could benefit from Alternatives 2 and 3. No other species of marine mammals would be effected by the proposed alternatives.

2.4.3 Coastal Zone Management Act

Each of the alternatives would be conducted in a manner consistent, to the maximum extent practicable, with the Alaska Coastal Management Program within the meaning of Section 30(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

2.5 Finding of No Singificant Impact

Inseason action to prohibit fishing for groundfish with trawl gear between 10 nm and 20 nm of the Akun, Akutan, Ugamak, Sea Lion Rock, Agligadak and Seguam Steller sea lion rookeries in November and December when significant levels of pollock may be harvested, as described under Alternative 2, is not likely to significantly affect the quality of the human environment, and the preparation of an environmental impact statement for selection of Alternative 2 as the proposed action is not required by Section 102(2)(C) of the National Environmental Policy Act or its implementing regulations.

DATE

3.0 REGULATORY IMPACT REVIEW: Social and Economic Impacts of the Alternatives

A review of the social and economic impacts of the alternatives provides information about those industry members affected by the proposed action and the economic gains or losses they are likely to experience as a result of the action. This section also addresses the requirements of both E.O. 12291 and the Regulatory Flexibility Act to provide adequate information to determine whether an action is "major" under E.O. 12291 or will result in "significant" impacts on small entities under the RFA.

Executive Order 12291 applies to the issuance of new rules, the review of existing rules, and the development of legislative proposals concerning regulations. The EO requires that:

- (1) regulatory objectives and priorities be established with the aim of maximizing aggregate net benefits to society, taking into account the condition of the particular industries affected by the regulations, the condition of the national economy, and other actions contemplated for the future;
- (2) decisions be based on adequate information concerning the need for and consequences of the proposed rules;
- (3) the chosen regulatory approach or alternative be the one with the least net cost to society, if practicable; and
- (4) regulatory action should not be undertaken unless the potential benefits outweigh the potential costs to society.

E.O. 12291 also requires the Secretary of Commerce to determine whether the impact of a regulation is "major" and, if so, complete a Regulatory Impact Analysis (RIA) of the alternatives. A major regulation is one that is likely to result in: (1) an annual effect on the economy of \$100 million or more; (2) a major increase in costs or prices for consumers, individual industries, Federal, State, or local government agencies, or geographic regions; or (3) significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S. based enterprises to compete with foreign based enterprises in domestic or export markets.

The purpose and need for the action and alternatives considered to address the potential impacts of the BSAI "B" season delay were given in sections 1.1 and 1.2. Because many of the principal groundfish species are widely distributed and, in some instances, highly migratory, it is unlikely that the proposed

closures in Alternative 2 would result in foregone pollock harvest. Trawl fishing effort is expected to be redistributed to the remaining open areas. The fishery's ability to completely compensate for lost fishing opportunities, and the additional cost of that compensation, varies under the various alternatives.

3.1 Socioeconomic Impacts of Alternative 1 - No Action

Under this alternative, the fishery would operate under the proposed management regime, in which the pollock "B" season in the BSAI will open on August 15 without seasonal trawl closures beyond the existing 10 nm no trawl zones around Steller sea lion rookeries. For a full description of the expected environmental impacts of Alternative 1, see the EA prepared for the proposed delay of the pollock "B" season in the BSAI (NMFS, February 2, 1993).

The purpose of the "B" season delay is to maximize the value of the pollock harvest by shifting fishing effort into the fall when the flesh quality appears to be higher. There would be no change to the socioeconomic conditions considered in the Environmental Assessment prepared for the proposed delay of the pollock "B" season in the Bering Sea/Aleutian Islands if no action was taken in November and December. However, if the Steller sea lion population continues to decline throughout the BSAI to the point that they are listed as an endangered species, the economic and socioeconomic costs are likely to be very great. At such time, more severe restrictions than are contained in this EA may be required in order to protect the remaining sea lion population. The size, extent, and duration of such impacts would be dependent upon the precise regulatory actions imposed and cannot be quantitatively evaluated at this time. It is clear, however, that regulatory actions that restricted fishing access to larger areas, extended controls to greater numbers of fisheries and gear-types, and/or are applied to increased periods of the fishing year would impose significantly greater costs on the fishing industry than those associated with the present set of management alternatives:

3.2 Socioeconomic Impacts of Alternative 2 - Extension of 20 nm trawl closures to November and December when "significant" levels of pollock are expected to be harvested in those months.

Under this alternative the existing trawl prohibitions around Steller sea lion rookeries would remain in effect, and trawl closures around Akun, Akutan, Ugamak, Sea Lion Rock, Agligadak and Seguam Steller sea lion rookeries would be extended to 20 nm by in-season action when "significant" directed fishing for pollock is expected during those months. For the purposes of this action, "significant" amounts will be considered 71,500 mt of pollock in the Bering Sea, or the equivalent of 10% of the "B" season TAC

including the CDQ and reserves. In the AI, 15% of the total TAC, or approximately 7,160 mt of pollock harvest will be considered significant. Again, this represents 1 week of average fishing effort. The 20 nm trawl prohibitions would remain in effect until the pollock TAC has been harvested.

The primary effect of Alternative 2 would be to close the waters between 10 and 20 nm of the Steller sea lion rookeries at Akun, Akutan, Ugamak, and Sea Lion Rock to groundfish trawling if significant amounts of the pollock (71,500 mt) remain to be harvested in November and December. The waters between 10 and 20 nm around the rookeries on Seguam and Agligadak would be closed if 7,160 mt of the AI pollock TAC remained to be harvested after November 1.

Aside from the pollock CDQ harvests, the "B" season pollock TAC will likely be taken before November of any year, precluding the need to expand the Steller sea lions trawl prohibition zones during the early winter. If the expansion of the no-trawl zones are needed due to the likelihood that greater than 71,500 mt of pollock harvest may occur in the BS in November and December, fishing effort may be redistributed. These closures would have only a minor effect on the overall ability of the fleet to harvest the "B" season BS groundfish TACs. While there is no "B" season fishery this year in the AI, the ability to institute similar restrictions in the AI is necessary to accommodate for any significant winter harvest proposed in the future.

Although the entire CDQ portion of the 1992 pollock TAC was taken in December, domestic pollock harvest has not historically occurred to any great extent in November and December. Figures 1 through 6 (Appendix) illustrate the foreign and joint venture pollock fishery trawl locations in November and December, 1984 through 1986. While there was some effort near the proposed closed areas, most of the pollock was harvested greater than 20 nm offshore.

Precise determination of the percentage of fishing effort that may be displaced by Alternative 2 is impossible. The entire "B" season pollock TAC A allocated to inshore and offshore component fisheries likely will be harvested prior to November 1, however, the ability to expand the sea lion conservation zones in the event that significant levels of fishing may occur after November is necessary to avoid deleterious impacts to Steller sea lions.

Implementation of 20 nm closed areas in November and December may increase costs for the trawl fishing fleet, with a higher relative cost borne by the inshore component of the fishery. Due to the low incidence of pollock harvest in November and December

historically, it is impossible to accurately predict where fishing effort would be expected to occur. However, the frequency of strong winds and high waves is highest in October and November in the Bering Sea, and remains high in December. This weather pattern increases the likelihood of accidents offshore, therefore vessels could be expected to fish closer to home ports, concentrating effort in the area southeast of the Pribilofs, on the Bering sea shelf during winter months. Alternative -2, by closing the waters within 20 nm of Akun, Akutan, Ugamak and Sea Lion Rock rookeries would be significantly reducing inshore fishing areas.

3.3 Socioeconomic Impacts of Alternative 3: Establish a directed BSAI pollock fishery closure date of November 1.

This action would close the entire BS management area to directed pollock fishing, regardless of the amount of TAC remaining to be harvested after November 1. Alternative 3 encourages the concentrated nature of the pollock trawl fishery by legislating the catch of the entire "B" season TAC to the period between August 15 and November 1. Additionally, CDQ fisheries, which do not by themselves harvest a significant amount of pollock in a manner expected to cause localized depletion of fish stocks, would be restricted under this alternative.

Under Alternative 3, it is likely that the entire inshore and offshore component fisheries during the "B" season would harvest available amounts of pollock before November of any year to avoid foregone opportunity to harvest pollock TAC. The CDQ fisheries, however, have a greater chance of being negatively affected economically by this alternative. Approximately 55,000 mt of pollock are available for harvest by CDQ fisheries after April 15th. Although the CDQ program has only been in place since December of 1992, when 100% of the 1992 CDQ reserve was taken due to the late opening of the fishery it is expected that CDQ fisheries would operate throughout the "B" season. Some of the CDQ reserve is expected to be conserved until December, when roe-bearing pollock may be harvested and only the CDQ harvest will be available to the market. While roe constituted only 4% of the total value of the December 1992 catch, the differences in value of pollock harvested in November and December and that harvested with the entire fishery prior to November 1 cannot be estimated accurately. The EA conducted for the proposed delay of the Pollock "B" Season in the BSAI discusses the complexity of price and market effects of monthly pollock catches.

3.4 Reporting Costs

None of the alternatives for the action proposed would increase the reporting burden on fishermen or processors.

3.5 Administrative, Enforcement, and Information Costs and Benefits

None of the alternatives for the proposed action would increase NMFS' or other management agency staff beyond that which is already required for the inseason monitoring and enforcement.

3.6 Summary of Economic Impacts:

None of the proposed alternatives would result in foregone pollock harvest. Under Alternative 1, there will be no changes to the economic impacts discussed in the EA prepared for the proposed delay of the pollock "B" season in the BSAI. However, if the Steller sea lion population continues to decline throughout the BSAI to the point that they are listed as endangered, more severe restrictions, with unquantifiable socioeconomic costs, could be required. Alternative 2 could result in redistributed fishing effort and increased transit costs in November and December if significant pollock TAC remains to be harvested in those months. Alternative 3 would encourage the harvest of the entire "B" season pollock TAC prior to November 1, and could result in an unquantifiable reduction in the value of the CDQ portion of the pollock harvest due to their inability to fish in November and December when there would be no other fish available to the market and when roe bearing fish may be present in the BSAI.

This action is not likely to result in (1) an annual effect on the economy of \$100 million or more; (2) a major increase in costs or prices for consumers, individual industries, Federal, State, or local government agencies, or geographic regions, or (3) significant adverse effects on competition, employment, investment, productivity, innovation or on the ability of U.S. based enterprises to compete with foreign based enterprises in domestic or export markets. Therefore, this is not a "major" action under E.O. 12291, and is not expected to result in "significant" impacts on small entities under the Regulatory Flexibility Act.

4.0 INITIAL REGULATORY FLEXIBILITY ANALYSIS

The objective of the Regulatory Flexibility Act is to require consideration of the capacity of those affected by regulations to bear the direct and indirect costs of regulation. If an action will have a significant impact on a substantial number of small entities an Initial Regulatory Flexibility Analysis (IRFA) must be prepared to identify the need for the action, alternatives,

potential costs and benefits of the action, the distribution of these impacts, and a determination of net benefits.

4.1 Economic Impact on Small Entities

The definition of a small entity includes harvesting vessels with annual gross receipts less than \$2,000,000 or seafood processors with less than 500 employees. Catcher/processor trawl vessels are both harvesting vessels and seafood processors so it is unclear which category they fit into. In 1992, there were approximately 60 at-sea processors who participated in the BSAI pollock fisheries. Alternative 2, which restricts fishing around six sea lion rookeries, will not have a significant impact on a substantial number of at-sea processors. While they may suffer some economic losses as a result of not being able to fish in these areas, this alternative does not restrict their ability to harvest pollock in other areas of the BSAI. The degree to which Alternative 3 would impact the at-sea processors depends on how much of the pollock TAC remains to be harvested after November 1. NMFS expects that there will be little or no reduction in the open access pollock fishery as a result of this alternative. However, participants in the CDQ fishery may be impacted if they have not harvested their quota prior to the closure. There are 12 processors harvesting pollock in the 1993 CDQ fishery. If the CDQ participants are aware of a November 1 closure, they will also have the opportunity to harvest pollock prior to this date. Alternative 3 is, therefore, also not expected to have a significant impact on a substantial number of small entities.

5.0 SUMMARY AND CONCLUSIONS

Under Alternative 2, the ability to implement expanded 20 nm no-trawl zones around Akun, Akutan, Ugamak and Sea Lion Rock rookeries in the event that significant levels of pollock TAC are available to be harvested after November 1 will provide mitigation of the potential effects of human activities on Steller sea lions during winter months. These rookeries abut the eastern Bering Sea shelf, which appears to be an important winter foraging area for Steller sea lions. Mitigation of potential fishery affects in November and December is necessary due to the numerous coincidental stresses on sea lions in winter months, including severe weather conditions, weaning of pups, early gestation, low prey diversity. This action may result in an increase in transportation costs due to the redistribution of vessels trawling for pollock and cod during winter months.

6.0 AGENCIES AND INDIVIDUALS CONSULTED

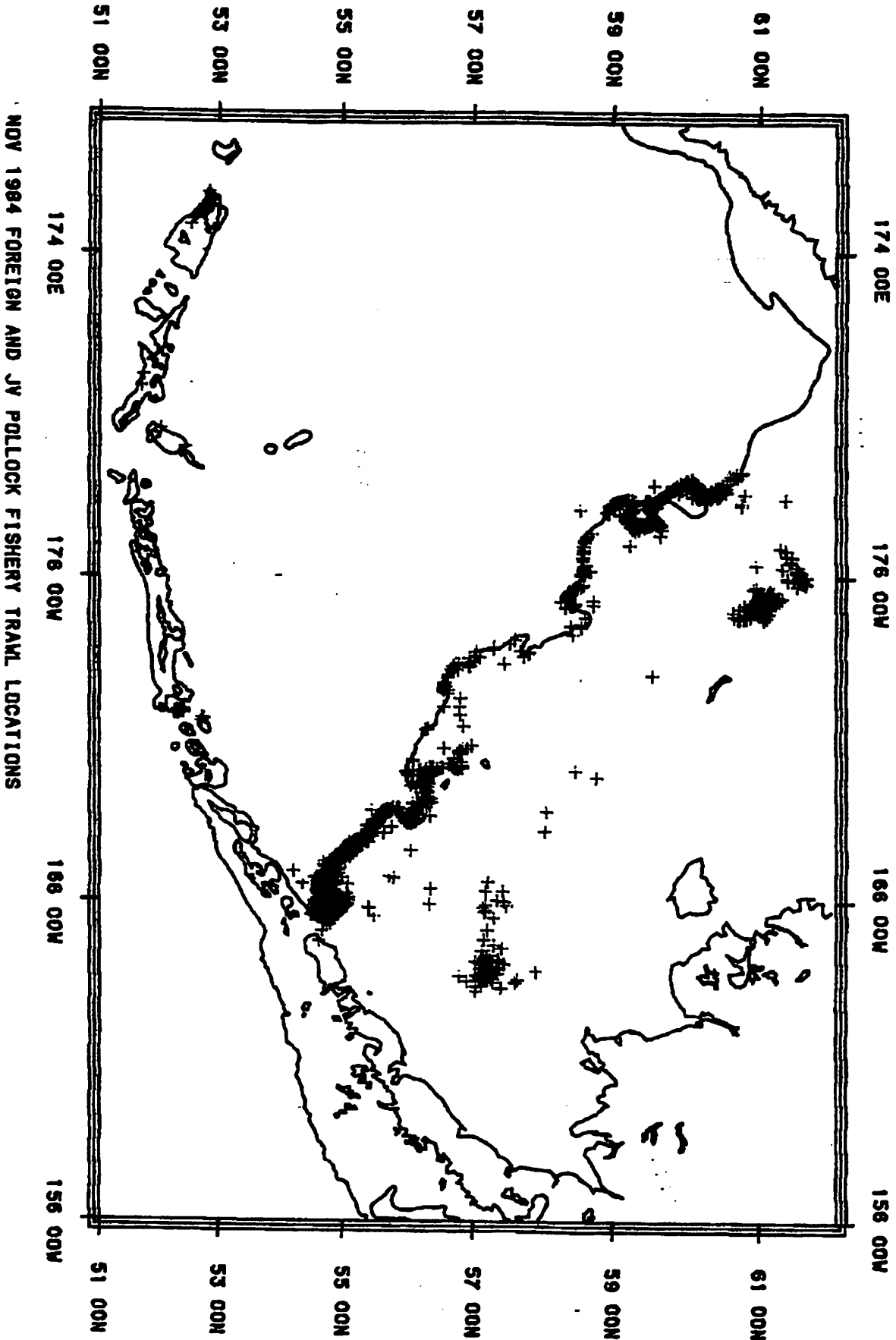
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FIGURE 1



URE 2

DEC 1984 FOREIGN AND JV POLLOCK FISHERY TRAWL LOCATIONS

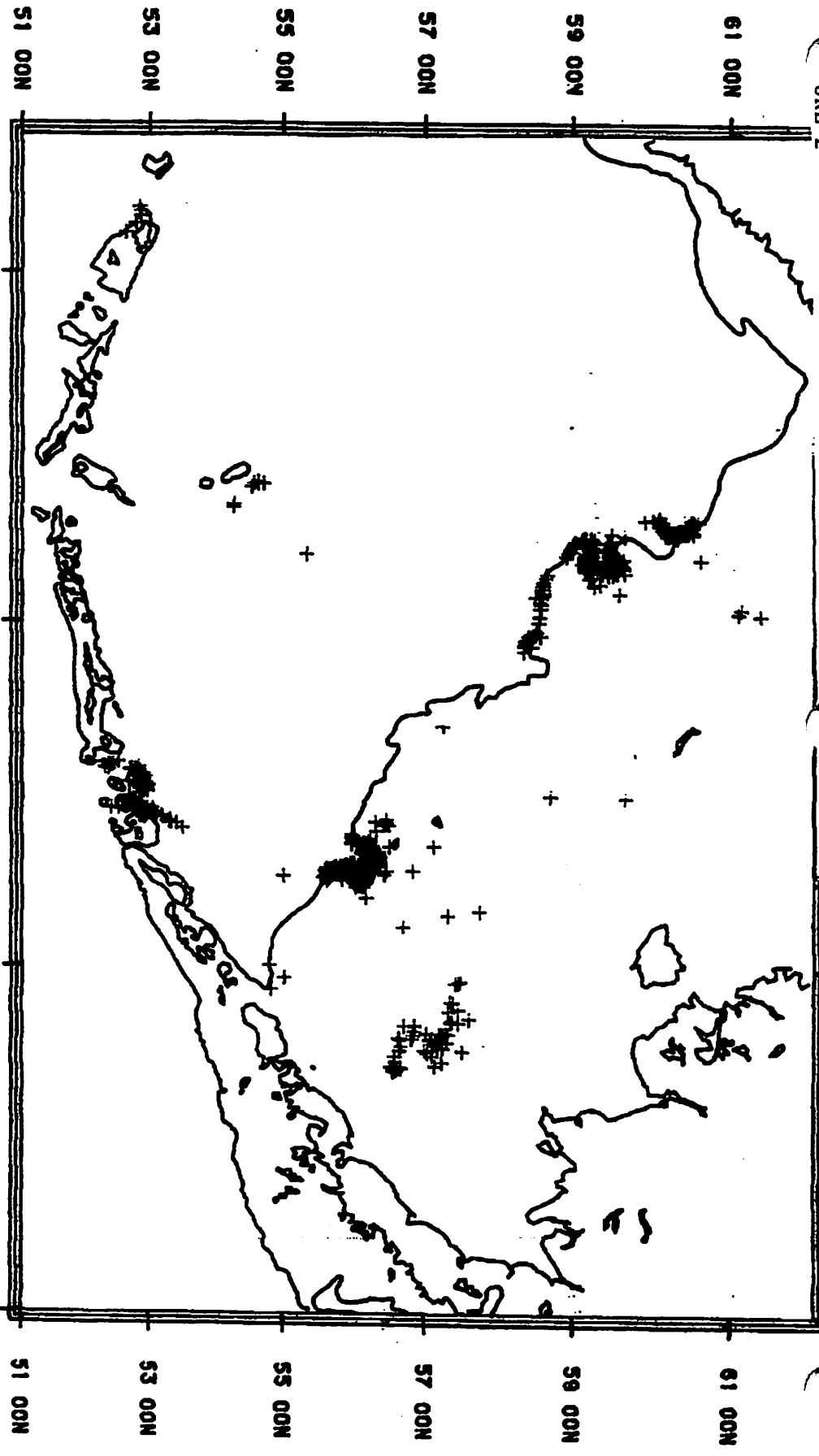


FIGURE 3

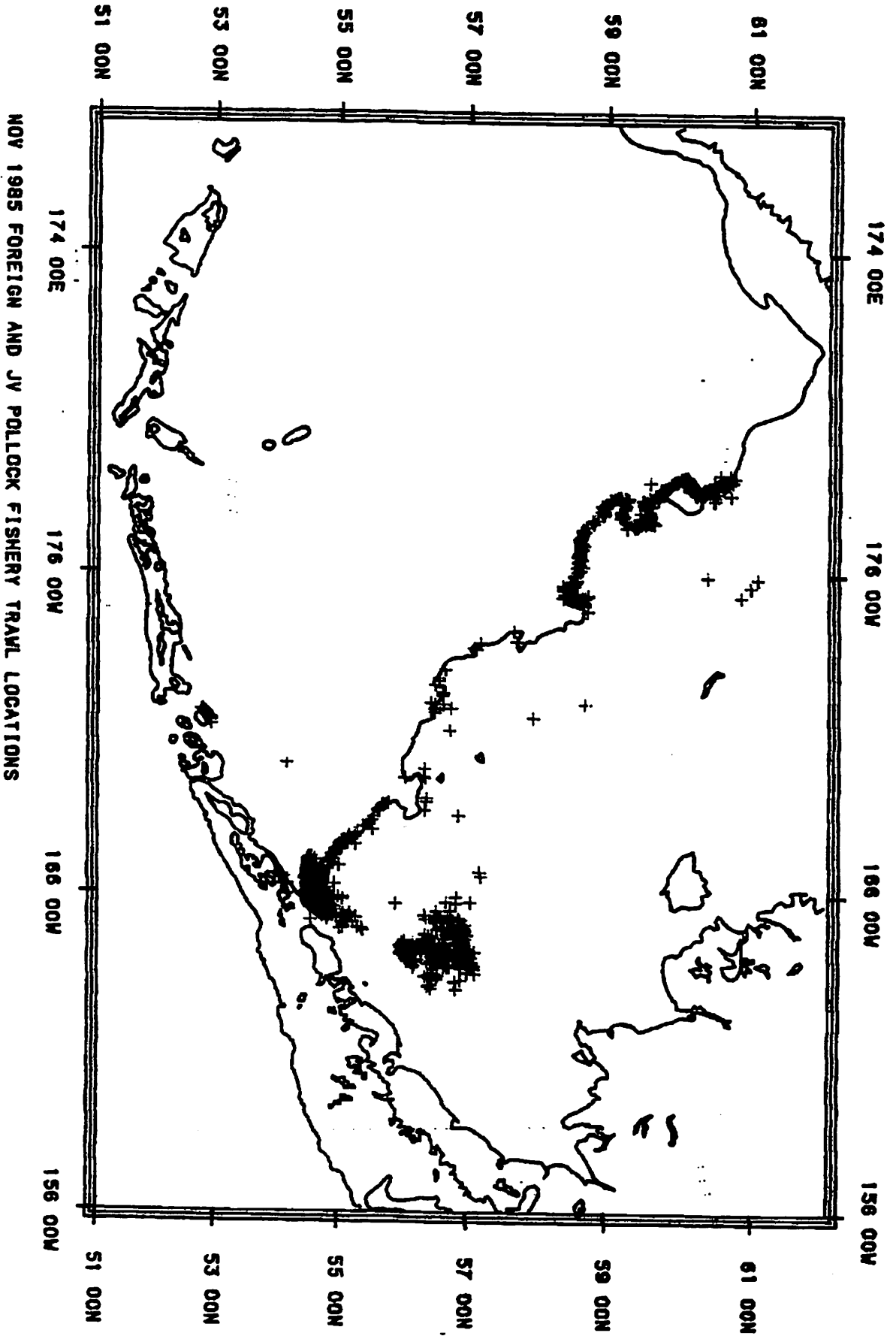


FIGURE 4

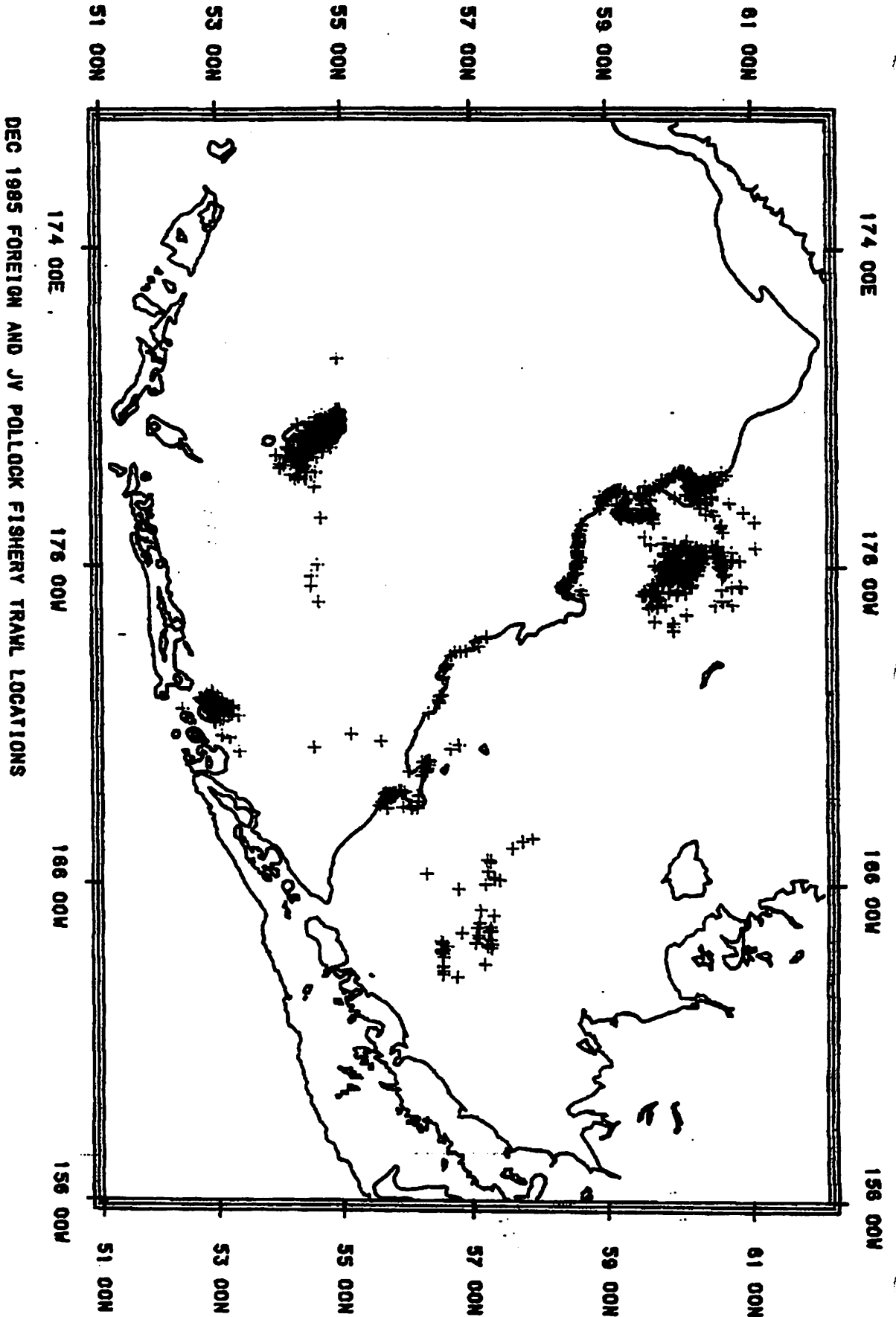


FIGURE 5

