ENVIRONMENTAL ASSESSMENT/ REGULATORY IMPACT REVIEW/ INITIAL REGULATORY FLEXIBILITY ANALYSIS

For a Regulatory Amendment to Provide a Two-Week Trawl Closure Near Unimak Pass to Facilitate an Experiment Investigating the Effects of Commercial Fishing on Local Abundance of Pacific Cod

Implemented Under The Authority Of The
Fishery Management Plan For The
Groundfish Fishery of the Bering Sea and Aleutian Islands

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Abstract: This Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR/IRFA) provides an analysis of a proposed regulatory amendment. Approval of the regulatory amendment would impose a two-week ban on trawl fishing in the specified area near Unimak Pass in the eastern Bering Sea. This short-term closure would be in effect between March 15 and March 31 in the years 2003 - 2006. The changes in fishing regulations are needed to permit NMFS to conduct unimpeded experiments on the effects of commercial trawling on local abundance of Pacific cod, as part of a comprehensive research program on sea lion/fishery interactions. The EA/RIR/IRFA provides an analysis of the expected impacts of proposed regulations on groundfish target species stock status, higher and lower trophic level species, and the physical and socioeconomic environment.

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TABLE OF CONTENTS

LIST OF FIGURES v

LIST OF TABLES v

EXECUTIVE SUMMARY vii

1.0 PURPOSE AND NEED FOR ACTION 1
- 1.1 Overview of the Cape Sarichef Cod Pot Study and Need for Action 1
- 1.2 Alternatives Considered 6

2.0 AFFECTED ENVIRONMENT 7
- 2.1 Study Area 7
- 2.2 NEPA Documents Concerning the Affected Area 7
- 2.3 Status of Groundfish Fisheries and Management in the Study Area 8
- 2.4 Status of Prohibited Species 8
- 2.5 Status of Marine Mammal Species 12
- 2.6 Seabird Species Population Status 12
- 2.7 Status of Marine Habitat 13
- 2.8 Status of Endangered or Threatened Species 13

3.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES 15
- 3.1 Environmental Impact of the No-Action Alternative 15
- 3.2 Environmental Impacts of Closure Alternatives 15
  - 3.2.1 Effects on Distribution of Fishing Effort 15
  - 3.2.2 Effects on BSAI Groundfish 19
  - 3.2.3 Effects on Bycatch and Incidental Catch of Prohibited Species 19
  - 3.2.4 Effects on Marine Mammals and ESA Listed Species 19
  - 3.2.5 Effects on Essential Fish Habitat, Benthic Habitat, and Water Quality 19
  - 3.2.6 Socio-Economic Impacts 20

4.0 EA SUMMARY & CONCLUSIONS 21

5.0 REGULATORY IMPACT REVIEW 22
- 5.1 Introduction 22
- 5.2 What is a Regulatory Impact Review? 22
- 5.3 Statutory authority 23
- 5.4 Purpose and need for action 23
- 5.5 Alternatives considered 27
- 5.6 Description of fishery 28
- 5.7 Benefits of the alternatives 38
- 5.8 Costs of the alternatives 43
- 5.9 Impacts on fishing communities 47
- 5.10 Impacts on minority and low-income populations 47
- 5.11 Summary of the benefits and costs 48
- 5.12 Summary of the significance criteria 50

5.13 Data Sources 51

6.0 INITIAL REGULATORY FLEXIBILITY ANALYSIS 53
6.1 Introduction 53
6.2 The purpose of an IRFA 53
6.3 What is required in an IRFA? 54
6.4 What is a small entity? 54
6.5 What is this action? 56
6.6 Reason for considering the proposed action 56
6.7 Objectives of, and legal basis for, the proposed action 57
6.8 Number and description of small entities affected by the proposed action 57
6.9 Impacts on regulated small entities 59
6.10 Recordkeeping and reporting requirements 59
6.11 Federal rules that may duplicate, overlap, or conflict with proposed action 59
6.12 Description of significant alternatives 60

7.0 LIST OF PREPARERS 61

8.0 LIST OF PEOPLE CONSULTED 61

9.0 LITERATURE CITED 63

APPENDIX A ..... Appen. A-1

LIST OF FIGURES

Figure 1.1-1 General location of Unimak Pass study area, and NMFS statistical reporting areas in the southeast Bering Sea. 3
Figure 1.1-2 Closeup of study area for NMFS cod pot fishery interaction study, including 10 meter depth contours. 4
Figure 1.1-3 Location of proposed closure for cod fishery interaction study, March 2003-2006. . . . 5
Figure 3.2-1 Seasonal timing of cod harvest from federal statistical area 517 from 1998 through 2002. 18
Figure 5.5-1 Approximate boundaries of closed areas under Alternatives 2-4 25
Figure 5.6-1 Communities where groundfish from the proposed closure area are landed 36

LIST OF TABLES

Table 1.2-1 Description of the alternatives 6
Table 2.3-1 Estimated catch by weight from the Bering Sea/ Aleutian Islands region for 1999-2002, by federal statistical reporting areas shown in Figure 1.1-1 10
Table 2.3-2 Distribution of commercial catch of all species and of Pacific cod for the BSAI region by quarter and gear type 11
Table 2.8-1 ESA listed and candidate species whose range included the Unimak Pass study area in the eastern Bering Sea 14
Table 3.2-1 Use of Study Region by Gear Types 17
Table 5.5-1 Description of the alternatives 28
Table 5.6-1 Numbers of vessels fishing groundfish in Alaska statistical area 655430 in the second half of March by year and by gear type 31
Table 5.6-2 Groundfish harvests from Alaska statistical stat area 655430 in the second half of March by year in metric tons 31
Table 5.6-3 Vessel level and processor level gross revenues from fishing groundfish in Alaska statistical area 655430 in the second half of March 32
Table 5.6-4 Second half of March Pacific cod harvests from Federal statistical reporting area 517, 1998-2002. 33
Table 5.6-5 Groundfish harvests from Area 655430 in the second half of March as a percent of harvests from other areas in the second half of March for vessels fishing in Area 655430 in the second half of March 34
Table 5.6-6 Numbers of vessels fishing groundfish in Alaska statistical area 655430 in the second half of March in more than one year, 1998-2002 34
Table 5.6-7 Location and volume of deliveries of unprocessed groundfish harvested in Alaska statistical area 655430 in the second half of March, 1998-2002 36
Table 5.6-8 Percent of the population claiming membership in six racial groups on the 2000 census in Unalaska, Akutan, and King Cove 37
Table 5.6.9 Low income populations in Akutan, Unalaska, and King Cove 37
Table 5.6-10 Alaska statistical area 655430 vessel groundfish harvest values in the second half of March by state of residence of vessel owner 38
Table 5.6-11 Communities with resident vessel owners whose vessels are active in the treatment area 38

Table 5.8-1 Pacific cod trawl red king crab caps and harvests in BSAI Zone 1 (measured in numbers of crabs) 45
Table 5.11-1 Summary of the cost and benefit analysis 49
Table 6.8-1 Large and small entities groundfish fishing in Alaska statistical area 655430 in the second half of March 58
Table 6.12-1 Alternatives subjected to detailed study 60

EXECUTIVE SUMMARY

This Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR/IRFA) reviews the potential impacts of a regulatory amendment to facilitate a sea lion fishery interaction experiment on the north side of Unimak Pass in the eastern Aleutian Islands. The experiment described in this document has been through initial design and feasibility stages without changes to fishing regulation. The regulatory amendment for this experiment will apply to the study area each March 15 to March 31 from 2003-2006 and will expire after 2006.

Environmental Assessment (EA)

The goal of the experiment is to evaluate the effects of commercial trawl fishing on Pacific cod (*Gadus macrocephalus*), which aggregate over spawning grounds in the Aleutian Islands and eastern Bering Sea during winter months and form an important component of the winter diet of Steller sea lions. The main effort of the study is focused around an experiment designed to test the localized depletion hypothesis, that commercial fisheries may adversely affect Steller sea lions by localized depletion of sea lion prey. Coupled with this experiment are studies on cod spawning habitat, behaviors, and seasonal movement. Expanded knowledge of Pacific cod spawning habitat and behavior is needed to define potential interactions of cod fisheries with sea lions, and may also improve stock assessment modeling and management of this species.

The localized depletion study is designed as a comparison between sites within the area subject to intensive seasonal trawling and "control" sites within a nearby zone where trawling is prohibited. Current regulations prohibit directed trawling for walleye pollock or Pacific cod within 10 nautical miles (nm) of specified Steller sea lion rookery and haulout sites, including Cape Sarichef on the northeastern tip of Unimak Island. The study area selected for the local abundance experiment includes the outer portion of the Cape Sarichef no-trawl zone and the open trawling grounds just outside this boundary.

A regulatory amendment is requested due to the incompatible nature of the trawl gear used in the treatment area, and the pot gear used in the experiment. NMFS will need to collect pot-fishing data within the trawled zone in March, after the most intensive part of the season. The preferred alternative would prohibit trawling, longlining and pot fishing in an experimental area during March 15 to March 31 of each year (2003 through 2006).

The purpose of this EA/RIR/IRFA is to assess the impacts of establishing such a restriction on fishing in the study area north of Unimak Pass. This EA addresses potential impacts of changes in the distribution of groundfish harvest on target groundfish species, higher trophic level species, Endangered Species Act (ESA) listed species, marine habitat, other predators and prey. In aggregate these impacts constitute an evaluation of the environmental impacts of the proposed regulatory amendment. The RIR/IRFA will also discuss potential economic and socioeconomic impacts of the proposed action. The proposed action considered under this EA would not affect allowable groundfish harvest amounts, but may change fishing patterns for the two-week duration of the closure.

Federal actions in the study area require consultation under section 7 of the ESA. Feasibility and pilot stages of the study have been carried out under scientific research permit 2002-06, which concluded that these activities were not likely to have an adverse affect on Steller sea lions. The effects of the proposed action (closure) on listed species are discussed in section 3 of this EA.

Regulatory Impact Review (RIR)

The Regulatory Impact Review (RIR) provides a cost-benefit analysis of this action, identifying and summarizing the tradeoffs associated with the alternatives. The RIR is required under Presidential Executive Order (E.O.) 12866 (58 *FR* 51735; October 4, 1993).

The most important fleet segment in this statistical area in the second half of March in recent years (1998-2001) has been medium sized (60-125 foot) bottom trawlers targeting Pacific cod and delivering them to shoreside processors. This fleet segment contributed the most vessels in each year, and produced the largest volumes of harvest in the earlier years.

The relative size of the catch of this fleet decreased, however, during this period. Vessels of this description harvested 78% of the groundfish from the statistical area in 1998, but (although the largest number of active vessels remained bottom trawlers) their share declined to 31% of the harvest in 2001. This decline was paralleled by an overall decline in harvests from this area over the period. It was, in fact, the decline in the harvests by this class of vessel which accounted for most of the decline in overall harvest from the area.

The smaller numbers of vessels in 2000 and 2001, and potential confidentiality issues, make it difficult to characterize the changes in the fleet. However, as harvests by the vessels described above declined, harvests by vessels with other characteristics became relatively more important. Catcher-processors became more important in 2000 and 2001. Pot gear, in particular became important in 2001, accounting for a third of the harvest that year. Harvests from vessels targeting Pacific cod declined somewhat, but remained high.

The first wholesale value of production from this statistical area in the second half of March ranged between $1.24 million and $2.67 million dollars per year over the period. Catcher vessels, which were the largest producing segment in the fishery, delivered their product to Akutan, Unalaska/Dutch Harbor, and King Cove. The first wholesale value of deliveries to these ports ranged between $860,000 in 2001 and $2.55 million in 1999. Most of the vessels active in the fishery were owned by persons residing in Washington and Oregon. Some were owned by persons residing in Alaska, California, and Maine.

Alternative 1 is the status quo and no action alternative. It is used here as the baseline against which to compare the other alternatives.

Alternative 2 will close the treatment area to all trawling between March 15 and March 31. This will protect the pot gear to be used in the experiment from loss through gear conflict. Results from the experiment have a greater likelihood of being useful for management decision making. The cost of experimental pot losses due to trawl-pot conflicts may be lower. Trawl vessels are expected to shift most of their fishing effort elsewhere. There may be an influx of hook-and-line and pot vessels into the treatment area when potential conflicts with trawl gear are eliminated by the trawl closure. Increased harvests caused by an influx of pot, and particularly of hook-and-line, gear may lead to a misinterpretation of the harvest rates obtained from the experimental pots. Specifically, large hook-and-line and pot removals during the period could result in decreases in local abundance that would be interpreted as a trawl effect. Moreover, an influx of pot and hook-and-line gear might lead to gear conflicts in early April when trawl gear would be allowed to fish in the treatment area again.

Trawlers may have increased costs due to the additional travel time required to fish somewhat further from Akutan, Unalaska/Dutch Harbor or King Cove. Revenue losses are expected to be minor. Community impacts, and impacts on minority and low income communities are expected to be minor.

Alternative 3 will close the treatment area to all trawling, and to longlining and fishing with pots, between March 15 and March 31. This alternative has benefits similar to those for Alt 2. In addition, this alternative may prevent an influx of pot and hook-and-line gear into the treatment area while the trawl gear is restricted. The potential for cost and revenue impacts on fishing operations is increased due to the restriction on pot and hook-and-line gear in addition to trawl gear. These additional costs are likely to be small; harvest and observer data suggests that little hook-and-line and pot fishing takes place in the treatment area in late March, presumably due to gear conflicts with trawls. Total cost and revenue impacts are still expected to be small, as are community impacts, and impacts on minority and low income communities.

Alternative 4 is the preferred alternative. Alternative 4 will close the treatment area to all trawling, and to longlining and fishing with pots, between March 15 and March 31. However, under Alternative 4, the treatment area has been redefined somewhat to allow trawl gear to continue to access certain deeper waters not needed for the experiment, and to add certain shallower waters (not heavily used by the trawlers in late March) to the treatment area. Alternative 4 imposes smaller costs on trawling operations than Alternative 3 and imposes similar (and small) costs on hook-and-line and pot operations.

Initial Regulatory Flexibility Analysis (IRFA)

The Initial Regulatory Flexibility Analysis (IRFA) examines the adverse impacts on small entities of the preferred alternative (Alternative 4). This IRFA is responsive to the requirements of the Regulatory Flexibility Act (5 U.S.C. 601-612).

The small entities that would be impacted by this action include the catcher vessels and catcher-processors fishing in the treatment area between March 15 and March 31. An estimated 21 to 56 of these entities operated in Alaska statistical area 655430 (which contains the majority of the treatment area) between 1998 and 2001, depending on the year. These small entities had average annual gross revenues of between $1.02 million and $1.63 million dollars a year between 1998 and 2001. Their average gross revenues from within statistical area 655430 in late March ranged from $10,505 to $18,850 during the same four year period. These statistical area 655430 revenue estimates provide high upper bounds for the actual expected impacts on these fishing operations.

The adverse impacts of the proposed action on these operations will be small. The average gross revenues from this statistical area are small compared to overall gross revenues over the course of the year. The treatment area itself, which is the only area affected by the regulations, is only one part of the statistical area, and a significant amount of the fishing activity by these vessels appears to be taking place within the statistical area, but outside of the treatment area. It appears likely that these vessels will be able to alter their operations to continue their fishing activity elsewhere in late March. Thus, even if the average gross revenues reported above were averages for the treatment area, which they clearly are not, it is likely that they would overstate the total adverse impact of the rule on the small entities. These operations will have to fish elsewhere and this may increase their costs, or reduce their overall revenues. One likely potential fishing area, to the northeast of the treatment area, would involve increased traveling time to and from the support and delivery ports at Akutan, Unalaska, and King Cove. This would be associated with some increased costs.

This action does not change the projected reporting, record keeping and other compliance requirements for these entities. It does not duplicate, overlap, or conflict with other Federal rules.

Alternatives 1 and 2 have lower adverse impacts on at least some categories of small entities than the preferred alternative. Alternative 1 is the status quo, under which no closure would be adopted. This alternative does not accomplish the objectives of the action. Alternative 2 does not limit activity by hook-and-liners and pot fishermen (unlike Alternatives 3 and 4). Closing the treatment area to trawling, but allowing an influx of hook-and-line and pot gear may produce a misinterpretation of experimental results, diminishing the value of the research, and may lead to gear conflicts between trawlers and fixed gear when the treatment area is reopened to trawling in early April. Alternative 2 does not have smaller adverse impacts on trawlers than the preferred; in fact, Alternative 2 is expected to have larger adverse impacts on trawlers since it excludes activity in deeper waters that are not needed for the experiment.

1.0 PURPOSE AND NEED FOR ACTION

An EA must include a brief discussion of the need for the proposal, the alternatives considered, the affected environment, the environmental impacts of the proposed action and the alternatives, and a list of document preparers. The purpose and alternatives will be in Sections 1.1 and 1.2. Section 2 describes the affected environment. Section 3 and 4 contain a discussion of the environmental impacts including impacts on threatened and endangered species and marine mammals. Sections 5 and 6 provide the RIR/IRFA. The list of preparers is in Section 7.

1.1 Overview of the Cape Sarichef Cod Pot Study and Need for Action

The groundfish fisheries in the Exclusive Economic Zone (3 to 200 miles offshore) of the Bering Sea are managed under a fishery management plan (FMP). The Bering Sea FMP (NPFMC 1999) was developed by the North Pacific Fishery Management Council (Council) under the Magnuson-Stevens Fishery Conservation and Management Act, P. L. 94-265, 16 U.S.C. 1801 (MSFCMA). The BSAI FMP was approved by the Secretary of Commerce (Secretary) and became effective in 1978 and updated July 6, 1999. In response to NMFS stewardship responsibilities identified in the MSFCMA, the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA), fishery regulations were changed to ensure that the BSAI and GOA groundfish fisheries neither jeopardize the continued existence of the western distinct population segment (DPS) of endangered Steller sea lions nor adversely modify its critical habitat.

Currently the information available to evaluate alternative methods for protecting Steller sea lions and their habitat is very limited. This can result in the use of less effective and less efficient management measures. NMFS has proposed a field experiment near Unimak Pass in order to improve the information available to assess further management actions to protect Steller sea lions and their habitat (See Appendix A for full project description). This study is an integral part of a NMFS comprehensive research program designed to evaluate effects of fishing on the foraging behavior of Steller sea lions.

The goal of the experiment is to evaluate the effects of commercial trawl fishing on Pacific cod (*Gadus macrocephalus*), which aggregate over spawning grounds in the Aleutian Islands and southeastern Bering Sea during winter months and form an important component of the winter diet of Steller sea lions. The main effort of the study is focused around an experiment designed to test the localized depletion hypothesis, that commercial fisheries may adversely affect Steller sea lions by localized depletion of sea lion prey. This study is designed as a comparison between sites within the area subject to intensive seasonal trawling and "control" sites within a nearby zone where trawling is prohibited. Coupled with this experiment are studies of cod spawning habitat, behaviors, and seasonal movement. A complete description of the localized depletion study and summaries of associated biological studies are attached as Appendix A. Expanded knowledge of Pacific cod spawning habitat and behavior is needed to define potential interactions of cod fisheries with sea lions, and may also improve stock assessment modeling and management of this species.

Commercial trawling for Pacific cod during the winter season is heavily focused on an area immediately north of Unimak pass and Unimak Island in the southeastern Bering Sea (Figure 1.1-1). The revised regulations for protection of Steller Sea Lions in 2002 prohibit directed trawling for walleye pollock or Pacific cod within 10 nautical miles (nm) of specified BSAI Steller sea lion rookery and haulout sites, including a rookery at Billings Head on Akun Island and a haulout at Cape Sarichef on Unimak Island. These trawl exclusion zones bracket the northeastern and northwestern sides, respectively, of Unimak

Pass (Figure 1.1-2). The Cape Sarichef zone, in particular, intersects the area that has historically been the main site of the winter cod trawl fishery. The study area selected for the local abundance experiment includes the outer portion of the Cape Sarichef no-trawl zone and the open trawling grounds just outside this boundary (Figure 1.1-3).

A regulatory amendment is requested due to the incompatible nature of trawling and fixed-gear fisheries. In order to conduct the "after" survey in the trawled zone, NMFS will need to set and haul experimental pots at the trawled sites without having research gear picked up or disturbed by trawls. NMFS's concern is not only the expense of lost gear, but the potential damage to the experimental design due to lost survey data.

The preferred alternative would prohibit trawl, hook-and-line, and pot fishing in the experimental area (the area designated as Alternative 4 in Figure 1.1-2) only during the "after" portion of the experiment, which will be scheduled for March 15 and March 31 of each year (2003 through 2006). This period was selected both because it immediately follows the most intensive trawling time, but also because it appears to be a period where commercial fishing effort in this area is usually low. The requested prohibition affects only a portion of the traditional cod fishing ground, and is limited to the two-week period needed for the experiment.

NMFS has conducted initial feasibility trials to develop design of the experiment and is ready to conduct the full localized depletion experiment in winter 2002-2003. NMFS anticipates that the cod pot study will be repeated in successive years, and so is requesting the regulatory amendment for the 2003-2006 fishing seasons. Replication of the study over several years is advisable to be sure that results are consistent over annual variations in stock size, fishing effort, and weather patterns. Repeated studies will also provide information on year-to-year variation in some of the basic biological data collected, and allow a multi-year tagging program. NMFS cod studies in the Unimak Pass area are being coordinated with physical oceanographic studies by the Pacific Marine Environmental Laboratory, other NMFS fisheries interaction studies, and projects of the National Marine Mammal Laboratory.

NMFS Statistical Reporting Areas in the Southeast Bering Sea

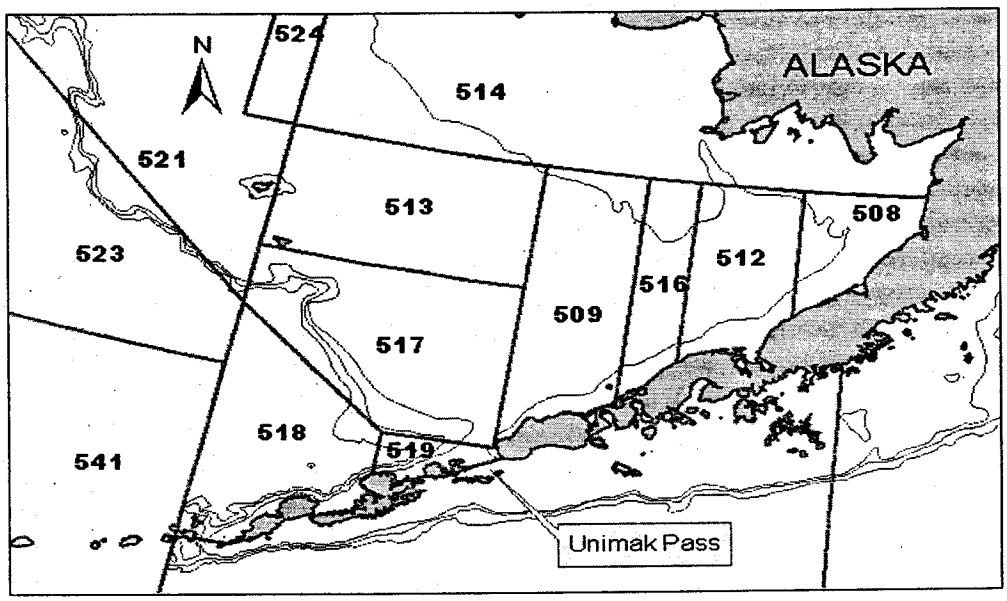


Figure 1.1-1 **General location of Unimak Pass study area, and NMFS statistical reporting areas in the southeast Bering Sea.**

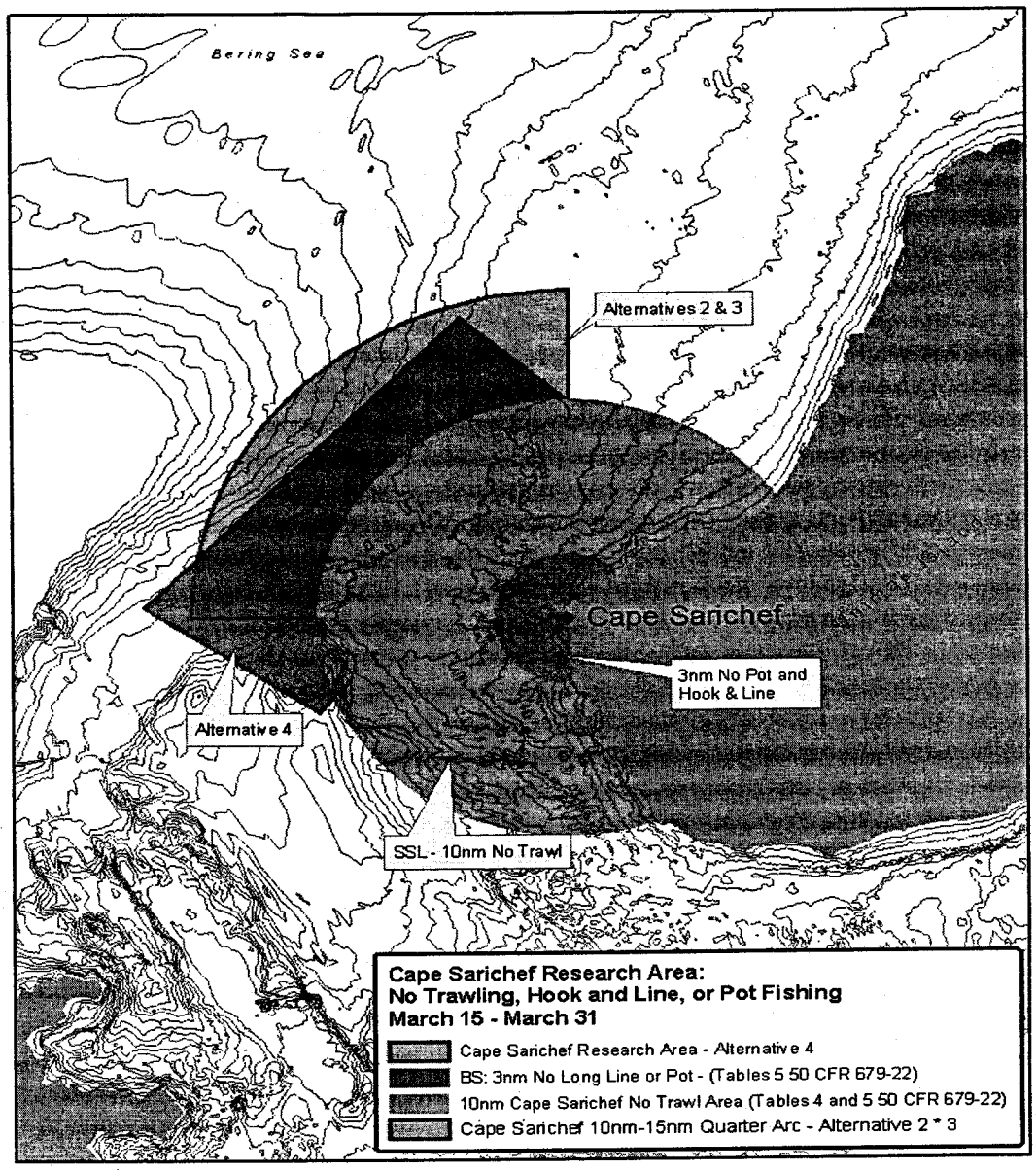


Figure 1.1-2 **Closeup of study area for NMFS cod pot fishery interaction study, including 10 meter depth contours.** Note the fairly broad plateau at 70-90 m that runs from the north side of Akun Island across the top of Unimak Pass. The "untrawled" portion of the study area is within the 10 nm trawl exclusion zone around Cape Sarichef on Unimak Island. The "trawled" portion is just outside this boundary on the northern side of Unimak Pass. Potential closed treatment areas associated with Alternatives 2,3, and 4, are shown on the northwest boundary of the "SSL No-trawl zone."

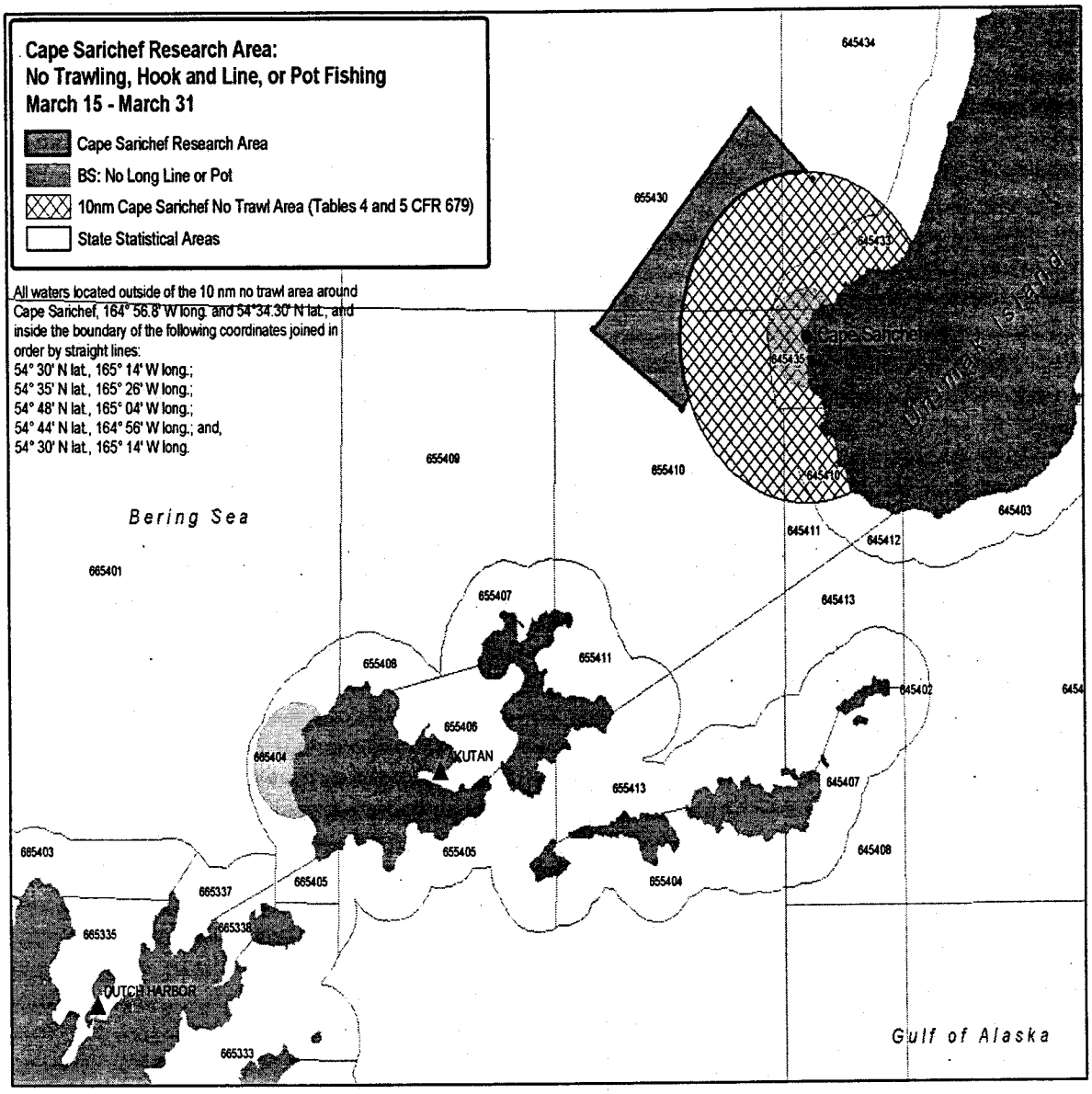


Figure 1.1-3 Location of proposed closure for cod fishery interaction study, March 2003-2006.

1.2 Alternatives Considered

Table 1.2-1 Description of the alternatives

Alternative 1	No Action / Status Quo	The experiment proceeds in 2003, 2004, 2005, and 2006 with no closure of the treatment area.
Alternative 2	Treatment Area Closure	The experiment proceeds in 2003, 2004, 2005, and 2006. In each of these years, no trawling would be permitted in waters located west of 164.56.80 W long. and north of 54.34.30 N. lat. and located from 10 nm to 15 nm from the haulout at Cape Sarichef, 164.56.8 W long. and 54.34.30 N. lat., between March 15 and 31. Regulations at 50 C.F.R. 679 would be amended to accomplish this.
Alternative 3	General Closure	The experiment proceeds in 2003, 2004, 2005, and 2006. In each of these years, no trawling, longlining, or pot fishing would be permitted in waters located west of 164.56.80 W long. and north of 54.34.30 N. lat. and located from 10 nm to 15 nm from the haulout at Cape Sarichef, 164.56.8 W long. and 54.34.30 N. lat., between March 15 and 31. The restriction would not apply to jigging. Regulations at 50 C.F.R. 679 would be amended to accomplish this.
Alternative 4	Modified closure area *(The preferred alternative)*	The experiment proceeds in 2003, 2004, 2005, and 2006. In each of these years, no trawling, longlining, or pot fishing would be permitted in waters located within a quadrilateral bounded by the four points: (1) 54 30 N 165 14 W, (2) 54 35 N 165 26 W, (3) 54 48 N 165 04 W, and (4) 54 44 N 164 56 W, and outside of an arc drawn drawn 10 nm from Cape Sarichef., between March 15 and 31. The restriction would not apply to jigging. *Note that this alternative differs from Alternative 3 only in the dimensions of the closed area. It excludes certain deeper waters included by Alternative 3, and includes certain waters at the southern end of the closed area in Alternative 3 that are not included by that alternative, and excludes certain waters at the northern end of the closed area in Alternative 3.* Regulations at 50 C.F.R. 679 would be amended to accomplish this.

2.0 AFFECTED ENVIRONMENT

2.1 Study Area

The area selected for the localized depletion study is along the outer Bering Sea shelf on the north side of Unimak Pass and Unimak Island (Figure 1.1-1). This area has traditionally been a popular fishing ground, and is a known spawning ground for Pacific cod. Commercial fishing has historically focused on this area because: 1) it often yields high concentrations of pollock and cod; 2) it is in close proximity to the major commercial port of Dutch Harbor; and 3) its proximity to Unimak pass and the eastern Aleutian Islands provide ready access to shelter from adverse weather. The pass is also an active international shipping channel.

The area that has historically been heavily fished is a plateau at 70-90 meters depth (40-50 fathoms) directly north of the pass and north of Cape Sarichef on the eastern tip of Unimak Island (Figure 1.1-2, see also Appendix A Figure A2 & Tables A1-A3). A popular trawl alley includes this plateau and generally runs along the 100 meter depth contour north and east from the pass. The proposed study area includes this plateau from 164°W to the horseshoe, approximately 166°W, and from the middle of Unimak pass (GOA/BSAI boundary) north to approximately 55°N.

2.2 NEPA Documents Concerning the Affected Area

The proposed closure will affect the spatial distribution of groundfish fishing in the southeast Bering Sea between March 15 and 31 of each study year.

Information on the status of the BSAI groundfish fisheries, management actions in the region, and the affected environment are given in the draft programmatic SEIS for Alaska Groundfish Fisheries (NMFS 2001a). Features of the physical environment are described in Section 3.1. Fishing gear effects on substrate and benthic communities are described in Section 3.2. Groundfish resources are in Section 3.3, marine mammals in Section 3.4, seabirds in Section 3.5, other species in Section 3.6, prohibited species in Section 3.7, contaminants in Section 3.8, interactions between climate, commercial fishing and the ecosystem in Section 3.9 and the socioeconomic environment in Section 3.10. This draft PSEIS (NMFS 2001a) is available for public review and comment through the NMFS Alaska Region home page at http://www.fakr.noaa.gov. Additionally, the status of each target species category, biomass estimates, and acceptable biological catch specifications are presented both in summary and in detail in the annual BSAI stock assessment and fishery evaluation (SAFE) reports (NPFMC 2001a). The economic status of the groundfish fisheries off Alaska are updated in NPFMC (2001b). Ecosystem considerations relevant to the BSAI were presented in a special chapter of the SAFE (NPFMC 2001c). This chapter includes assessment of impacts to essential fish habitat.

Information on the impact of the groundfish fisheries on Steller sea lions is contained in the November 2001 SEIS on Steller sea lion protection measures (NMFS 2001b). This document includes in Appendix A the biological opinion on the effects of the pollock, Pacific cod and Atka mackerel fisheries on Steller sea lions and other ESA listed species.

Designated target species and species groups in the BSAI are walleye pollock, Pacific cod, yellowfin sole, Greenland turbot , arrowtooth flounder, flathead sole, rock sole, other flatfish, sablefish, Pacific Ocean perch, other red rockfish, other rockfish, Atka mackerel, squid and other species. TACs and catch

in 2001, along with final 2002 specifications of OFLs, ABCs, and TACS for the BSAI and GOA are discussed in the EA for the 2002 TAC Specifications (NMFS 2001c). For detailed life history, ecology, and fishery management information regarding groundfish stocks in the BSAI, see Section 3.3 of the draft programmatic SEIS (NMFS 2001a).

2.3 Status of Groundfish Fisheries and Management in the Study Area

The primary commercial fisheries in the study area are for walleye pollock and Pacific cod. Some commercial trawling for yellowfin sole and other flatfish occurs in the study area, but the amount of both effort and take from these fisheries are minor. Table 2.3-1 shows the estimated total catch for the BSAI region for 1999-2002, by federal statistical reporting area (source: NMFS Blend data). The overwhelming majority of both of the total catch and of catches for pollock and cod come from three reporting areas, with the greatest fraction of all three catches coming from area 517. Area 517 includes the Unimak Pass study area and the outer shelf around the "horseshoe" north toward the Pribilof Islands (Figure 1.1-1). When catch is broken down to only the winter season (January-March), it is easy to see that trawling for pollock and cod are the principal activities in the area (Table 2.3-2). Inshore and state waters around Unimak and Akun Islands are also fished for cod with fixed gear, primarily pots.

The highest commercial catches from the study area are for walleye pollock. The status of this fishery is described in 2001 BSAI SAFE (NPFMC 2001a). Estimates of total exploitable biomass for the pollock stock in the eastern Bering sea are currently over 11 million tons. The stock shows dramatic year-to year variation in biomass levels due to high annual variability in recruitment; a strong 1996 year-class is expected to contribute to high levels of biomass over the next few years. The 2001 stock assessment for this stock concluded that pollock stock levels are above MSST and that the stock is not overfished or approaching overfished conditions.

While overall catches of Pacific cod are substantially less than for pollock, a major portion of the BSAI regional catch of Pacific cod comes from the eastern Bering sea. As shown in Table 2.3-2, the bottom trawl take of Pacific cod is the major commercial catch in the study area during the winter season. Status of the Pacific cod fishery is discussed in the 2001 SAFE (NPFMC 2001a). The 2002 estimate of adult (age 3+) biomass of Pacific cod for the eastern Bering sea in 2002 is 1.3 million tons. Various model scenarios in the stock assessment show levels well above MSST and conclude that the stock is not overfished or approaching overfished condition.

2.4 Status of Prohibited Species

Prohibited species taken incidentally in BSAI groundfish fisheries include: Pacific salmon (chinook, coho, sockeye, chum, and pink), steelhead trout, Pacific halibut, Pacific herring, Alaska king crab, Tanner, and snow crab. The Council recommends some prohibited species catch (PSC) limits to control its bycatch of prohibited species in the groundfish fisheries and other PSC limits are set in regulation at 50 CFR 679.21. During haul sorting, these species or species groups are to be returned to the sea with a minimum of injury except when their retention is required by other applicable law. The status of the different prohibited species are summarized in Section 3.7 of the draft programmatic SEIS (NMFS 2001a). Bycatch of prohibited species from the BSAI groundfish industry are reported in Appendix C of the SAFE (NPFMC 2001a). Bycatch of Pacific halibut and king crab are closely monitored and can

become a factor in closing of bottom trawl fisheries. Bycatch of other species is generally well below PSC limits.

Table 2.3-1 Estimated catch by weight from the Bering Sea/ Aleutian Islands region for 1999-2002, by federal statistical reporting areas shown in Figure 1.1-1 (Source: NMFS blend data). * Data for Jan-June 2002, all months of previous years.

All Species - Catch by Federal Statistical Area

Year	508	509	512	513	514	516	517	518	519	521	523	524	541	542	543	BSAI Total (mt)
1999	0.0%	20.4%	0.0%	12.4%	1.7%	1.0%	37.1%	0.2%	1.1%	18.0%	0.3%	0.2%	3.0%	2.4%	2.1%	1,427,274
2000	0.0%	24.0%	0.0%	10.9%	0.6%	1.6%	32.2%	0.2%	1.6%	21.0%	0.4%	0.6%	2.7%	2.4%	1.7%	1,614,560
2001	0.0%	14.5%	0.1%	13.0%	0.4%	3.6%	25.6%	0.1%	8.5%	25.7%	1.4%	0.5%	1.6%	2.6%	2.4%	1,818,849
2002*	0.0%	31.2%	0.1%	7.7%	1.4%	2.8%	27.1%	0.1%	3.2%	20.0%	0.7%	0.2%	2.5%	1.8%	1.3%	1,217,155
4-year Avg	0.0%	21.7%	0.1%	11.2%	0.9%	2.3%	30.4%	0.2%	3.9%	21.5%	0.7%	0.4%	2.4%	2.3%	1.9%	1,519,460

Pollock - Catch by Federal Statistical Area

Year	508	509	512	513	514	516	517	518	519	521	523	524	541	542	543	BSAI Total (mt)
1999	0.0%	21.1%	0.0%	10.8%	0.2%	0.2%	46.5%	0.0%	0.2%	20.8%	0.0%	0.0%	0.0%	0.0%	0.0%	990,855
2000	0.0%	22.3%	0.0%	8.9%	0.0%	2.2%	39.2%	0.0%	1.3%	25.1%	0.3%	0.5%	0.1%	0.0%	0.0%	1,133,981
2001	0.0%	12.7%	0.0%	11.8%	0.0%	4.0%	30.5%	0.0%	10.2%	28.8%	1.6%	0.3%	0.0%	0.0%	0.0%	1,388,276
2002*	0.0%	34.1%	0.0%	5.8%	0.0%	2.5%	31.7%	0.0%	3.3%	21.9%	0.6%	0.0%	0.1%	0.0%	0.0%	928,024
4-year Avg	0.0%	21.5%	0.0%	9.6%	0.1%	2.4%	36.6%	0.0%	4.3%	24.6%	0.7%	0.2%	0.0%	0.0%	0.0%	1,109,034

Pacific Cod - Catch by Federal Statistical Area

Year	508	509	512	513	514	516	517	518	519	521	523	524	541	542	543	BSAI Total (mt)
1999	0.0%	19.8%	0.2%	9.6%	0.4%	1.8%	23.0%	1.2%	4.7%	20.8%	1.5%	0.7%	11.8%	3.0%	1.3%	173,930
2000	0.0%	19.5%	0.0%	8.4%	0.1%	0.2%	26.0%	0.9%	4.5%	19.1%	1.0%	0.5%	11.4%	4.6%	4.7%	191,056
2001	0.0%	19.2%	0.7%	9.7%	0.2%	2.0%	14.3%	1.0%	5.5%	25.1%	0.9%	2.1%	8.0%	4.2%	7.2%	176,746
2002*	0.0%	22.6%	1.1%	10.4%	0.1%	2.9%	17.7%	0.2%	5.2%	15.8%	1.2%	0.9%	15.7%	4.9%	1.3%	135,776
4-year Avg	0.0%	20.1%	0.4%	9.5%	0.2%	1.6%	20.2%	0.9%	5.0%	20.4%	1.1%	1.1%	11.5%	4.1%	3.8%	169,877

Table 2.3-2 Distribution of commercial catch of all species and of Pacific cod for the BSAI region by quarter and gear type

Table 2.3-2. Distribution of commercial catch of all species and of Pacific cod for the BSAI region by quarter and gear type.
Quartery periods begin on the first of January, April, July, and October, respectively.
All catches expressed as percentage of the total or in metric tons of estimated catch (Source: NMFS Blend data).

BSAI Region - All Species
Distribution of Catch by Quarter

	Quarter				
Year	1	2	3	4	Total
1999	40.7%	8.7%	36.2%	14.4%	1,427,274
2000	39.4%	8.2%	40.2%	12.1%	1,614,560
2001	36.6%	6.7%	45.8%	10.9%	1,818,849
2002	64.5%	10.6%	24.9%	0.0%	1,217,155
Average	666,587	127,122	575,522	200,306	1,519,460

Stat Area 517 - All Species
Distribution of Catch by Quarter

	Quarter				
Year	1	2	3	4	Total
1999	34.6%	3.3%	41.2%	20.9%	529,771
2000	50.1%	2.7%	33.0%	14.2%	520,129
2001	25.4%	2.0%	56.6%	16.0%	466,481
2002	60.7%	3.7%	35.6%	0.0%	329,421
Average	190,600	13,328	192,807	86,287	461,450

BSAI Region - Pacific Cod
Distribution of Catch by Quarter

	Quarter				
Year	1	2	3	4	Total
1999	51.9%	25.7%	9.9%	12.5%	173,930
2000	55.6%	14.6%	12.5%	17.3%	191,056
2001	48.0%	9.8%	21.1%	21.1%	176,746
2002	82.0%	13.7%	4.3%	0.0%	135,776
Average	98,143	27,135	21,055	30,726	169,377

Stat Area 517 - Pacific Cod
Distribution of Catch by Quarter

	Quarter				
Year	1	2	3	4	Total
1999	61.1%	20.8%	7.8%	10.2%	40,078
2000	63.3%	10.6%	12.9%	13.2%	47,674
2001	42.7%	7.7%	27.1%	22.5%	25,191
2002	83.7%	13.5%	2.7%	0.0%	24,074
Average	21,405	4,644	4,191	5,353	34,254

BSAI Region - Pacific Cod
Distribution of Catch by Gear Type

Year	LONGL	JIG	POT	TRAWL	All Gear
1999	51.3%	0.1%	9.3%	39.3%	173,930
2000	51.2%	0.0%	9.9%	38.8%	191,056
2001	61.2%	0.0%	9.6%	29.1%	176,746
2002	40.4%	0.1%	8.1%	51.4%	135,776
Average	87,550	113	15,779	65,928	169,377

Stat Area 517 - Pacific Cod
Distribution of Catch by Gear Type

Year	LONGL	JIG	POT	TRAWL	All Gear
1999	33.4%	0.0%	2.7%	63.9%	40,078
2000	39.3%	0.0%	7.2%	53.6%	47,674
2001	57.1%	0.0%	7.6%	35.3%	25,191
2002	27.2%	0.0%	7.0%	65.8%	24,074
Average	13,261	2.4	2,024	18,969	34,254

2.5 Status of Marine Mammal Species

The status of marine mammal species in the eastern Bering sea and Aleutian Islands is reviewed in detail in stock assessments produced by the National Marine Mammal Laboratory (Angliss et al 2001). The study area is part of the known range of several species of cetaceans, including the gray whale, humpback whale, fin whale, minke whale, northern right whale, killer whale, pacific white-sided dolphin, harbor porpoise, Dall's porpoise, and Stejners beaked whale. Of these species, the humpback whale, fin whale, and northern right whale are listed as endangered species under the ESA (see Section 2.8 below). Pinniped species whose range includes the Unimak Pass area include Steller sea lions, northern fur seals, and harbor seals; the western stock of Steller sea lions is listed as endangered under the ESA and northern fur seals are listed as "depleted" under the MMPA.

The draft programmatic SEIS for Alaska groundfish fisheries (NMFS 2001a) contains a detailed analysis on the ecology, population trends, and the impacts of an array of alternative TAC specifications on marine mammals. For further information see Section 3.4 and 4.2 of the draft programmatic SEIS , and the section on marine mammals in the ecosystems chapter of the 2001 SAFE (NPFMC 2001a). Recent reviews of Steller sea lion population status in Alaska are contained in the Section 7 Biological Opinion on ESA listed species (NMFS 2001b).

2.6 Seabird Species Population Status

Seabirds spend the majority of their life at sea rather than on land. Alaska's extensive estuaries and offshore waters provide breeding, feeding, and migrating habitat for approximately 100 million seabirds. Thirty-four species breed in the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) regions and number 36 million and 12 million individuals, respectively. Another 6 species breed at other locations in Alaska. In addition, up to 50 million shearwaters and 3 albatross species feed in Alaskan waters during the summer months but breed farther south. Detailed seabird information on species population status, life history, ecology, and bycatch is contained in section 3.5 of the SEIS (NMFS 1998a) and in the draft SEIS (NMFS 2001a).

Since publication of the 1998 SEIS, NMFS has reported the incidental take of 2 endangered short-tailed albatrosses in the hook-and-line groundfish fishery of the BSAI. NMFS conducted section 7 consultations with USFWS in 2000. The first FMP-level consultation is on the effects of the BSAI and GOA FMPs in their entirety on the listed species (and any designated critical habitat) under the jurisdiction of the USFWS. The second consultation is action-specific and is on the effects of the 2001 to 2004 TAC specifications for the BSAI and GOA groundfish fisheries on the listed species (and any critical habitat) under the jurisdiction of the USFWS. This action-specific consultation will incorporate the alternatives proposed in this SSL PM SEIS for the 2002 groundfish fisheries. The most recent Biological Opinion on the effects of the groundfish fisheries on listed seabird species expired December 31, 2000. NMFS requested and was granted an extension of that Biological Opinion and its accompanying Incidental Take Statement. USFWS intends to issue a Biological Opinion in late 2002.

2.7 Status of Marine Habitat

The environmental assessment prepared for the 2002 BSAI harvest specifications (NMFS 2001c) contains an assessment of impacts to essential fish habitat as required by amendments to the Magnuson-Stevens Fishery Conservation and Management Act of 1996. This assessment addresses the effects of the authorization of the proposed and final specifications on EFH pursuant to the requirements of 50 CFR 600.920(h) and in coordination with the review procedures required under the National Environmental Policy Act. The assessment of the impacts on EFH (NMFS 2001c) concludes that fishing actions may have substantial adverse impacts on fish habitat essential to the spawning, breeding, feeding and growth to maturity of managed and un-managed species. In a formal response to the assessment dated December 14, 2001, the NMFS Habitat Conservation Division, Alaska Region (HCD) concurred in the assessment that fishing may have adverse impacts on EFH for managed species but concluded that any adverse effects have been minimized to the extent practicable (NMFS 2001d). The actions authorized by the year 2002 harvest specifications have been mitigated, and are continually being mitigated, as a result of protective measures implemented under the Magnuson-Stevens Act. NMFS has already designated areas of essential habitat or has curtailed fishing in a season or location as a result of previous, and ongoing actions, or has taken measures to protect critical habitat for the Steller sea lion that also benefits EFH for managed species in those areas. The NMFS HCD affirmed that these mitigative measures have minimized any substantial impacts on EFH of this Federal action to the extent practicable, and offered no additional EFH recommendations.

Given that an EFH assessment has been completed with the mandatory requirements and components of an EFH assessment as specified in 50 CFR 600.920 (g)(2), and given that 50 CFR Section 600.920(h)(3) states that once a Federal agency has submitted to NMFS an EFH assessment completed in accordance with paragraph (g) of this section that the Federal agency has fulfilled its consultation requirement under paragraph (a), NMFS affirms that the consultation requirements as required under the statute have been fulfilled. For further information about the habitat and ongoing habitat studies in the fisheries management area, see Section 3.1 and 3.6 of the draft programmatic SEIS (NMFS 2001a), and the Ecosystems Considerations Chapter for 2002 (NPFMC 2001c).

2.8 Status of Endangered or Threatened Species

The Endangered Species Act of 1973 as amended (16 U.S.C. 1531 *et seq*; ESA), provides for the conservation of endangered and threatened species of fish, wildlife, and plants. The program is administered jointly by the NMFS for most marine mammal species, marine and anadromous fish species, and marine plants species, and by the USFWS for bird species, and terrestrial and freshwater wildlife and plant species. Twenty-three species occurring in the BSAI and GOA groundfish management areas are currently listed as endangered or threatened under the ESA. Of these species, Table 2.8-1 shows those whose range includes the Unimak Pass study area. Section 7 consultations with respect to actions of the federal groundfish fisheries have been done for all the species listed in Table 2.8-1, either individually or in groups.

Table 2.8-1 ESA listed and candidate species whose range included the Unimak Pass study area in the eastern Bering Sea.

Common Name	Scientific Name	ESA Status	Whether reinitiation of ESA Consultation is occurring
Blue Whale	*Balaenoptera musculus*	Endangered	No
Sei Whale	*Balaenoptera borealis*	Endangered	No
Fin Whale	*Balaenoptera physalus*	Endangered	No
Humpback Whale	*Megaptera novaeangliae*	Endangered	No
Right Whale	*Balaena glacialis*	Endangered	No
Steller Sea Lion (WesternPopulation)	*Eumetopias jubatus*	Endangered	No
Steller's Eider [1]	*Polysticta stelleri*	Threatened	Ongoing
Short-tailed Albatross [1]	*Phoebaotria albatrus*	Endangered	Ongoing
Spectacled Eider[1]	*Somateria fishcheri*	Threatened	Ongoing
Northern Sea Otter[1]	*Enhydra lutris*	Candidate	No

[1]The Steller's eider, short-tailed albatross, spectacled eider, and Northern sea otter are species under the jurisdiction of the U.S. Fish and Wildlife Service. For the bird species, critical habitat has been proposed only for the Steller's eider (65 FR 13262). The northern sea otter has been proposed by USFWS as a candidate species (November 9, 2000; 65 FR 67343).

3.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

Areas to be examined for possible impacts from a proposed action include impacts to groundfish target species, fishery bycatch, incidental catch of prohibited species, marine mammals, ESA listed species, essential fish habitat, benthic habitat, and water quality. Analysis of each of these issues is detailed below. No significant impacts to any of these issues have been found. For a more complete explanation of issues pertinent to fisheries management actions, and description of what would comprise a significant impact, refer to the EA for the 2002 TAC (NPFMC 2001a).

3.1 Environmental Impact of the No-Action Alternative

Since the no-action alternative involves no changes to normal fishing practices, it has no environmental impact other than those determined for the 2002 TAC process (NPFMC2001a). If no action is taken, the NMFS localized depletion study will still be conducted in 2003. Without the requested closure, NMFS anticipates increased expense to conduct the study and a greater risk of inadequate or inconclusive study results. Research pot gear damaged or disturbed by trawlers will lead not only to higher equipment costs, but to a smaller number of study sites being covered by the pot study. If the number of study sites successfully completed is substantially reduced by gear conflicts, the power of the statistical test to determine the presence or absence of a localized depletion effect could be jeopardized.

3.2 Environmental Impacts of Closure Alternatives

Alternatives 2, 3 and 4 are described in detail in Table 1.2-1. They would prohibit commercial trawling from a small portion of the traditional ground near Unimak Pass between Mach 15 and 31, 2003 through 2006.

- Alternative 2 (trawl closure) would close a quarter-arc along the northwest boundary of the existing Cape Sarichef no-trawl zone to all trawling from March 15 to March 31 (Figure1.1-3).
- Alternative 3 is a general closure for the quarter-arc, restricting both trawl and fixed-gear fishing in the closed area from March 15 to March 31. At present, there is relatively little fixed-gear use of the proposed closure area because of gear conflicts with trawl fisheries. Alternative 3 is designed to prevent fixed-gear vessels (primarily hook-and-liners) from making substantial removals of cod from the study area as the "after" leg of the experiment is being conducted. Large removals during this period could result in decreases in local abundance that would be interpreted as a trawl effect.
- Alternative 4 is the preferred alternative. Alternative 4 is a general closure for a modified closure area (not the entire quarter-arc), restricting both trawl and fixed-gear fishing in the closed area from March 15 to March 31. Alternative 4 modifies the "quarter-arc" closure area so as to reduce the potential burden on trawling operations, without affecting the scientific value of the experiment.

3.2.1 Effects on Distribution of Fishing Effort

The three closure alternatives will potentially decrease the amount of catch taken from the target area during the two-week period of closure, and may displace some trawling or general fishing effort during this period into other areas of the eastern Bering Sea. As described in section 5.6 of the attached RIR/IRFA, the number of commercial vessels fishing in Alaska State statistical area 655430 (which

includes almost all of the proposed closure area) decreased from 64-67 in 1998-99 to only 34-39 vessels in 2000-2001. Almost all of these vessels are bottom trawlers. Out of 113 vessels fishing in the area from 1998 to 2001, only 27 fished in this area in more than two years (Table 5.6-6). Table 3.2-1 shows analysis of trawling effort in the proposed closure region based on NMFS Observer data, which represents primarily the efforts of vessels over 100ft. This analysis indicates that the proposed closure area accounts for a substantial fraction of observed hauls over the entire year, but only a small number of hauls and vessels during the last two weeks of March. This time period was selected for the closure in part because it is after the major trawling season, when the level of fishing effort in this area generally declines (Figure 3.2-1).

Table 3.2-1 Use of Study Region by Gear Types

Table 3.2-1. Use of Study Region by Gear Types. All Data from NORPAC Observer Database.							
	BSAI refers to the entire federally-regulated Bering Sea and Aleutian Island region.						
	Study Region is defined as BSAI region from Latitude 54-55 and Longitude 164-166.						
	Closure Zone refers to the quarter-arc from 10nm to 15nm around Cape Sarichef.						
	Reported catch rates are observer-estimated official total catch (OTC) and						
	estimated total catch weight for pollock and cod from observed hauls, all in metric tons.						
		All Observed Bottom Trawl Hauls					
		#Vessels	#Hauls	Effort(hrs)	OTC	Pollock	Cod
All BSAI, Jan-April							
	1999	104	15,508		315,121		
	2000	112	9,376		185,666		
	2001	88	7,432		134,707		
	2002	84	7,876		152,666		
Study Region, Jan-April							
	1999	79	1,246	5,381	15,311	2,954	9,553
	2000	87	1,206	5,459	12,870	3,456	6,985
	2001	56	490	2,150	4,117	604	2,371
	2002	57	895	3,967	9,094	1,769	5,798
Closure Zone, Jan-April							
	1999	72	377	1,714	3,627	593	2,693
	2000	68	433	1,990	3,698	712	2,567
	2001	29	86	408	561	76	385
	2002	47	387	1,888	3,548	556	2,615
Proposed Closure (Closure Zone, March 15-31 ONLY)							
	1999	22	51	242	401	154	200
	2000	10	24	139	149	40	77
	2001	7	7	33	48	8	30
	2002	7	20	90	140	19	11.1

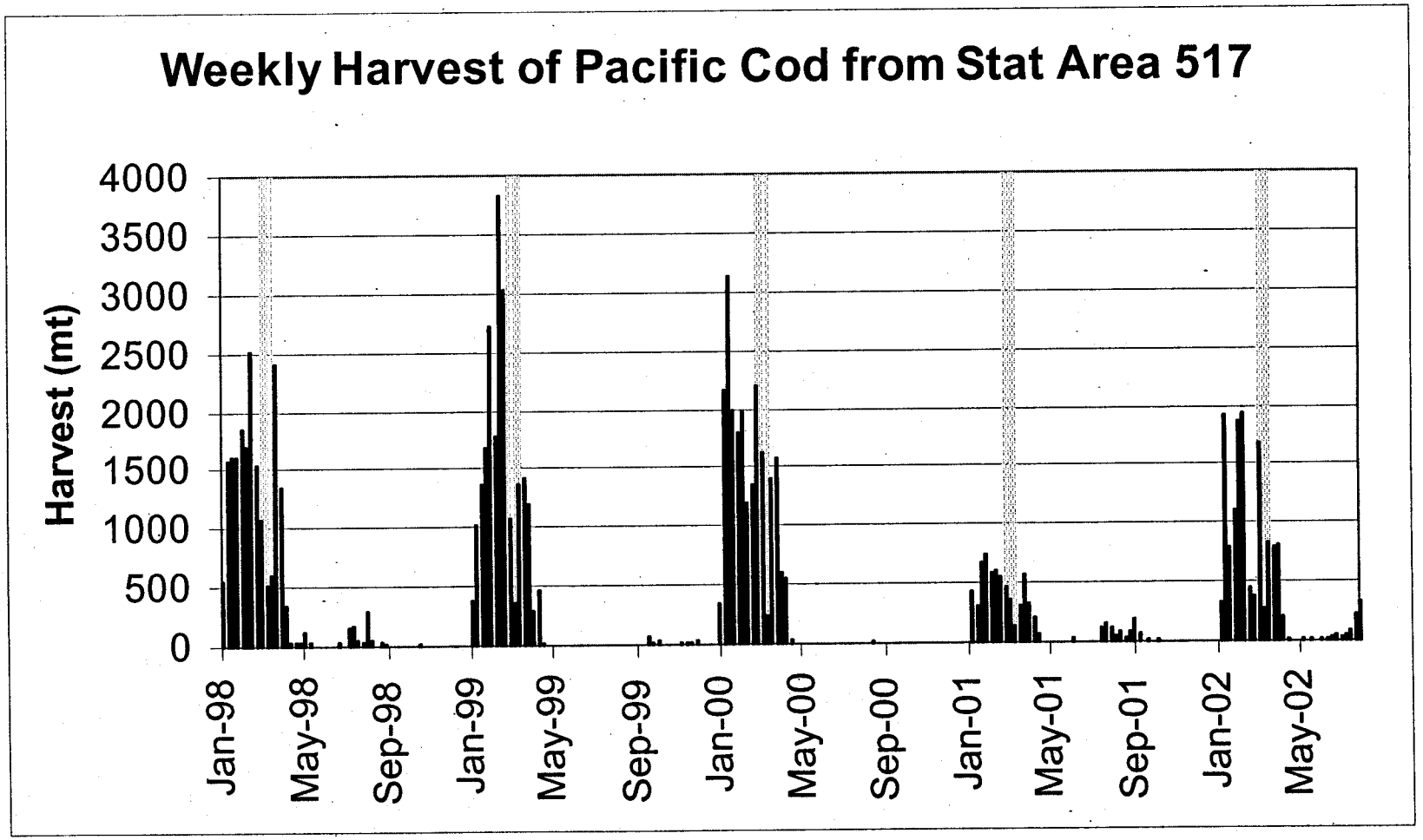


Figure 3.2-1 **Seasonal timing of cod harvest from federal statistical area 517 from 1998 through 2002.** Solid bars show total harvest of cod by week (Source: Alaska Regional Mgmt Data). Shaded periods are weeks intersecting the proposed March 15-31 closure. Each year, the peak of the cod harvest in this area is in from February through mid-March. In most years, the proposed closure period concides with a temporary lull in cod harvest.

3.2.2 Effects on BSAI Groundfish

Since none of the three proposed closure alternatives changes the regional and seasonal TACs for groundfish species, the alternatives are expected to have no impact on BSAI groundfish species. Redistribution of trawling, longlining or pot fishing effort during the two-week closure may have some small-scale effects on groundfish in the immediate study area, however the amount of fishing activity affected by the closure is expected to be small.

3.2.3 Effects on Bycatch and Incidental Catch of Prohibited Species

Alternative 1 would not change the expected catch of prohibited species. Fishing at the level established by the final 2002 harvest specifications for groundfish in the BSAI (67 FR 956, January 8, 2002) is not expected to adversely affect stocks of fish or invertebrates prohibited in groundfish fisheries harvest. Catches of Pacific halibut in the BSAI are controlled by PSC limits. Section 4.3.5 of the draft programmatic SEIS (NMFS 2001a) describes the possible impacts on prohibited species. New information presented in section 3.2 and the EA for final TAC specifications for 2002 (NMFS 2001c) does not demonstrate any impacts that NMFS considers to be significant or that were not already analyzed in the SEIS.

Alternatives 2, 3 and 4 might result in some change in the species composition and/or rate of bycatch of prohibited species, since fishing effort will be moved to different areas. However, regional bycatch of prohibited species will remain controlled by PSC limits, which have been set to minimize impacts on prohibited species. The proposed action is of short duration and the amount of fishing activity redistributed to other areas is small, therefore the proposed action is not expected to impact overall bycatch rates or populations of prohibited species in the BSAI.

3.2.4 Effects on Marine Mammals and ESA Listed Species

In 2001, the RFRPA for the BSAI fishery were modified by a committee process supported by the Council. The resulting Steller sea lion protection measures were approved by NMFS and implemented by emergency interim rule for 2002. Consultations were conducted for the Steller sea lion protection measures (NMFS 2001b) and for the harvest specifications for 2002, as implemented by emergency interim rule (67 FR 956, January 8, 2002). These consultations found no likelihood of jeopardy or adverse modification of habitat for any endangered species with the actions. **Based on this ruling, none of the proposed alternatives for this action will have adverse environmental effect on endangered species.** Fishing activity excluded from the closure area is expected to move to other areas that are open under approved RFRPAs.

3.2.5 Effects on Essential Fish Habitat, Benthic Habitat, and Water Quality

The management areas where the fisheries take place are identified as essential fish habitat (EFH) for all the managed species listed in the fishery management plans. NMFS prepared an assessment of impacts to essential fish habitat (NMFS 2001c) and received a letter of consultation in reply (NMFS 2001d). In that letter NMFS stated it concurs in the **assessment that fishing may have adverse impacts on EFH for managed species but concluded that any adverse effects have been minimized to the extent practicable.**

The potential shifts in fishing effort caused by the temporary no fishing zone are not expected to have a significant impact on essential fish habitat. The small area and short time frame of the proposed closure would create only minor shifts in the geographic distribution of fishing effort. Fishing excluded from the closure area is expected to move to other areas routinely used by the fishery, and the amount of additional fishing in any given area is not expected to increase significantly.

The proposed action will have no impact on water quality.

3.2.6 Socio-Economic Impacts

Section 5.6 of the Regulatory Impact Review (RIR), and Section 6.8 of the Initial Regulatory Flexibility Analysis (IRFA), provide detailed descriptions of the fishing operations and communities that will be affected by this action. Sections 5.7 to 5.10 of the RIR summarize the impacts of this action on fishing operations and communities, and Section 6.9 of the IRFA describes the socio-economic impacts of this action. A summary of these sections is provided here; the reader is referred to the relevant sections in the RIR and IRFA for detailed information.

The treatment area is a small portion of State of Alaska statistical reporting area 655430 and very small portions of areas 655410 and 645434. Observer data indicated that insignificant amounts of groundfish fishing occurs in the portions of the treatment area in statistical areas 655410 and 645434, therefore catch data from these areas are not included in analysis for alternative 4. The analysis was able to make estimates of fishing activity and production for the State statistical area 655430 as a whole, but was not able to do a finer breakdown and estimate statistics specifically for the treatment area. Therefore, reported statistics must be thought of as placing an upper bound on activity and impacts of the action in the treatment area.

The most important fleet segment in this statistical area in the second half of March in recent years (1998-2001) has been medium sized (60-125 foot) bottom trawlers targeting Pacific cod and delivering them to shoreside processors. The relative size of this fleet, as well as its relative share of catch, decreased, however, during this period. Vessels of this description harvested 78% of the groundfish from the statistical area in 1998, but (although the largest number of active vessels remained bottom trawlers) their share declined to 31% of the harvest in 2001. This decline was paralleled by an overall decline in harvests from this area over the period. It was, in fact, the decline in the harvests by this class of vessel which accounted for most of the decline in overall harvest from the area.

The smaller numbers of vessels in 2000 and 2001, and potential confidentiality issues, make it difficult to characterize the changes in the fleet. However, as harvests by the vessels described above declined, harvests by vessels with other characteristics became relatively more important. Catcher-processors became more important in 2000 and 2001. Pot gear, in particular became important in 2001, accounting for a third of the harvest that year. Harvests from vessels targeting Pacific cod declined somewhat, but remained high.

The first wholesale value of production from this statistical area in the second half of March ranged between $1.24 million and $2.67 million per year over the period. Catcher vessels, which were the largest producing segment in the fishery, delivered their product to Akutan, Unalaska/Dutch Harbor, and King Cove. The first wholesale value of deliveries to these ports ranged between $860,000 in 2001 and $2.55 million in 1999. Most of the vessels active in the fishery were owned by persons reporting their

residence as being in Washington and Oregon. Some were owned by persons reporting their residence as being in Alaska, California, and Maine.

The impacts of these alternatives on fishermen, fish processors, communities, and low income or minority populations, are not expected to be significant. First, the estimates of harvest provided are for the entirety of statistical area 655430, and are greater than the estimates of production from the treatment area itself. Second, the fishing operations in statistical area 655430 were not heavily dependent on activity in this area, even in the second half of March. Table 5.6-5 indicates that they obtained between about 10% and 28% of their gross revenues from this area between 1998 and 2001, depending on the year. Third, the RIR analysis suggests that these vessels could substantially compensate for lost fishing opportunities in this area by fishing nearby. This change in fishing patterns would be likely to increase operating costs somewhat, since the vessels may be fishing somewhat further from the support and delivery services available in Akutan, Unalaska, and King Cove. The impacts on communities, and minority and low income populations, are expected to flow from any change in vessel activity patterns. Since the impacts on vessels are expected to be relatively small, the other impacts are also expected to be relatively small.

4.0 EA SUMMARY & CONCLUSIONS

The setting of the proposed action is the groundfish fisheries of the BSAI on the north side of Unimak Pass. Any effects of the action are limited to this area. The effect of the alternatives on society within this area is limited to the individuals who may participate in trawl, hook-and-line and pot fisheries in the Unimak Pass area during the latter half of the month of March. This action has no impacts on society as a whole or regionally.

Beneficial and adverse impacts are required to be considered in this action. The effects of the proposed action alternatives (Alternatives 2, 3, and 4) are treated in section 3.0 of this EA/RIR/IRFA. The result of the action is the potential redistribution of fishing effort in the BSAI region from March 15-31 of the years 2003-2006. The potential redistribution of fishing effort due to the proposed closure is likely to be minor and would not be sufficient to cause a significant impact on other groundfish fisheries. Fishing occurs over many areas of the BSAI during this period and the amount of fishing displaced is small. The potential shifts in fishing effort are not expected to have an impact on essential fish habitat, marine mammal, or ESA listed species. The action is requested in support of research on localized changes in fish abundance associated with intensive trawling operations. This information is important to regulatory policy regarding interactions of commercial fishing operations with endangered Steller sea lions.

Public Health and Safety are not impacted by this action due to the limited duration and coverage of this action. No geographic consideration is with this action because no activities are required by this action that may affect a geographic area. No known risks to the human environment will occur by taking this action. This action will have no effect on districts, sites, highways, structures, or objects listed or eligible for listing in the National Register of Historic Places, nor cause loss or destruction of significant scientific, cultural, or historical resources.

Cumulatively significant impacts are not anticipated with this action because no impacts have been identified. This action is associated with an NMFS research project that will be reviewed each year through issuance of a research fishing permit; permits issued for this project in 2002 found no significant environmental impact of the research study and permits for successive years are expected to do the same.

Because of the short duration and the limited area affected by the proposed closure, this action has no long term effect on the fishing practices in the BSAI.

This action poses no known violation of Federal, State, or local laws or requirements for the protection of the environment. This action poses no known possibility of the introduction of non-indigenous species because it does not affect the activities of vessels that may introduce such organisms into the marine environment.

5.0 REGULATORY IMPACT REVIEW

5.1 Introduction

This Regulatory Impact Review (RIR) examines the costs and benefits of regulatory alternatives to close waters north of Unimak Pass to fishing for groundfish during the last two weeks of March in 2003, 2004, 2005, and 2006. These waters are adjacent to an area already closed to trawling for Pacific cod and pollock due to the proximity of a Steller sea lion haulout at Cape Sarichef on the western end of Unimak Island in the Aleutians.

This closure is meant to increase the scientific value of an experiment to test the hypothesis that Pacific cod trawling causes localized depletion of Pacific cod stocks. The results of this experiment may have important implications for regulations that currently restrict fishing activity in order to protect Steller sea lion stocks.

5.2 What is a Regulatory Impact Review?

This RIR is required under Presidential Executive Order (E.O.) 12866 (58 *FR* 51735; October 4, 1993). The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following statement from the order:

> In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nonetheless essential to consider. Further, in choosing among alternative regulatory approaches agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

E.O. 12866 requires that the Office of Management and Budget review proposed regulatory programs that are considered to be "significant". A "significant regulatory action" is one that is likely to:

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, local or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

5.3 Statutory authority

The National Marine Fisheries Service manages the U.S. groundfish fisheries of the Bering Sea and Aleutian Islands Management Area in the Exclusive Economic Zone under the Fishery Management Plan (FMP) for that area. The North Pacific Fishery Management Council prepared the FMP under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Regulations implement the FMP at §50 CFR part 679. General regulations that also pertain to U.S. fisheries appear at subpart H of §50 CFR part 600.

5.4 Purpose and need for action

What is localized depletion, and why does it matter?

The past 20 years have seen large declines in the population of the western distinct population segment (DPS) of the Steller sea lion. This population segment of the Steller sea lion has been listed as endangered under the Endangered Species Act (ESA). The reasons why the DPS has declined are not understood very well. However, the depletion of stocks of sea lion groundfish prey by commercial fishermen near the Stellers' haulouts and rookeries has been identified as a possible cause. The principal groundfish species of concern are pollock, Akta mackerel, and Pacific cod. The experiment discussed in this analysis is concerned with the localized depletion of Pacific cod.

Fishing in an area removes part of the Pacific cod stock from that area. If harvested fish are replaced immediately by fish that migrate in from nearby areas, there is no change in food availability. However, if the harvested fish are not replaced immediately, there may be a reduction in food availability for stocks of Steller sea lions feeding in that area. Sea lions of may eat less, or they may use more energy to capture any given amount of food.

Fishing regulations implemented with the 2002 fishing year have imposed restrictions on commercial fishing for pollock, Pacific cod and Atka mackerel near rookeries and haulouts. These restrictions are believed to be expensive for industry. The RIR prepared at the time the restrictions were under consideration, estimated that the total annual value of Pacific cod formerly taken from the waters now to be restricted was on the order of $21 million per year in the BSAI and GOA. The value taken by trawl gear was $6 million per year.[1] While much of this gross value was undoubtedly offset by changes in fishing patterns: (a) not all of it may have been, (b) it was likely done at increased cost, and (c) the burden is widely believed to have fallen more heavily on small entities which are less able to travel further from port. Moreover, the regulations imposed in 2002 were controversial. Many believe the appropriate regulations should be more restrictive. One alternative that was considered in 2002 would have restricted waters from which Pacific cod worth an estimated $48 million per year were taken ($28 million a year worth of trawl fish). (NMFS, 2001(c), pages C132-C140.)

[1]The Pacific cod and trawl estimates are presented here because the proposed experiment would examine the impact of Pacific cod trawling on localized depletion.

What will this experiment tell us?

The issue of localized depletion raises several important questions. Does trawling locally deplete Pacific cod stocks? Do these stocks recover, and if so, how fast do they recover? Does localized depletion interact with the foraging habits of Steller sea lions to affect Steller sea lion nutrition, morbidity, and mortality? There is very little information available about these important questions.

The Alaska Fisheries Science Center has obtained funding to perform an experiment designed to determine whether or not trawling for Pacific cod will locally deplete cod resources. Funding is available to perform the experiment in 2003, and the AFSC is trying to obtain funding to duplicate the experiment in 2004, 2005 and 2006. The details of the experiment are in Appendix A.

Under Alternatives 2, 3, and 4, treatment areas will be located to the north of Unimak Pass, in waters subject to intensive bottom trawling for cod between January and April (with the most intense fishing in February and early March). Two alternative treatment areas are proposed. One, (incorporated into Alternatives 2 and 3) is a simple arc around the outside of the Cape Sarichef closed trawl area. A second treatment area (incorporated into Alternative 4), which includes a modified closure area, excludes certain deeper waters included under Alternatives 2 and 3, and includes certain waters at the southern end of the closed area proposed under Alternatives 2 and 3. A control area will be located in the adjacent no-trawl zone around Cape Sarichef and includes as far as is possible the same range of depths, slopes, and bottom types found in the treatment areas. Together, the treatment and control areas will allow the scientists to compare areas that are heavily trawled and that are not heavily trawled.

These treatment and control areas are shown in Figure 5.5-1. The treatment areas under Alternatives 2 and 3 and Alternative 4 are both identified. The control area would be within the area marked "SSL No-trawl zone."

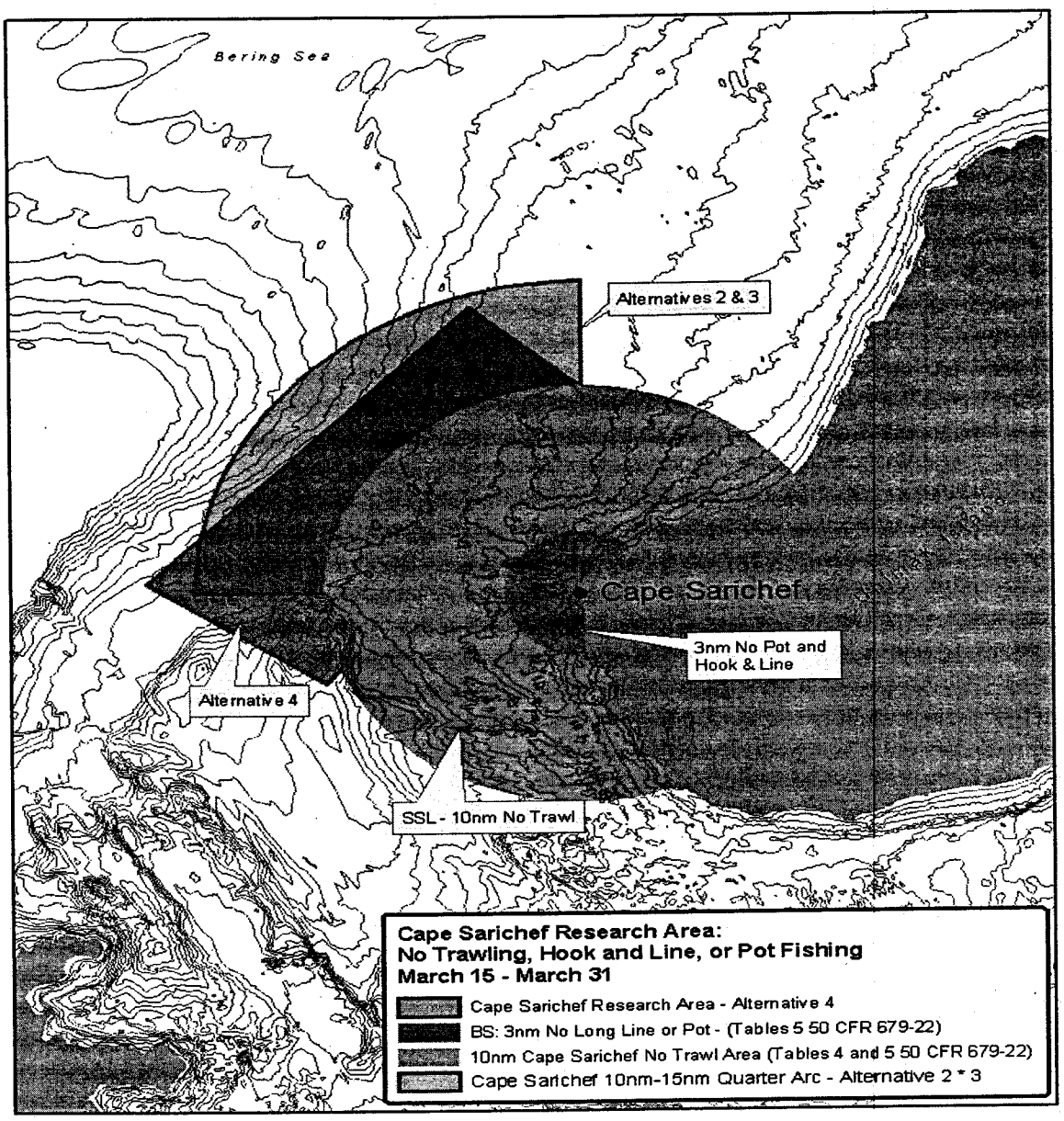


Figure 5.5-1 Approximate boundaries of closed areas under Alternatives 2-4

The treatment and control areas will be surveyed, using pot gear similar to that used for commercial fishing, both immediately before the opening of the season and in the second half of March after the most heavily fished stage of the spawning season. Within each area, changes in catch rates between the "before" and "after" surveys will be measured at a number of sites. It is assumed that, in the absence of a fishing effect, all of the sites will exhibit the same relative change in catch rates between the before and after surveys. This assumes that many factors affecting seasonal differences in cod density (spawning aggregation, migration, responses to weather events and tides, and localized movement) should be acting similarly over the region, regardless of location relative to the arbitrary no-trawl zone boundaries.

A Fisher randomization test will be used to test the null hypothesis that the change in catch rates is the same for fished and unfished sites. This nonparametric test is expected to have greater power and far less sensitivity to outliers than a parametric t-test for difference in change between the two groups. See Appendix A for further information.

Pot catch rates are intended as a relative measure of fish density that will reveal changes over time at a particular site. Pot gear is proposed because its catch variability is less than trawl samples and it is known to be effective for Pacific cod. Since cod are most important in the SSL diet during the winter season, the experiment is designed around the winter-season fishery. Initial feasibility work was performed in June 2001 and a pilot study was conducted at Unimak Pass in March-April 2002. The results of the pilot study suggest that the experimental design is feasible.

The proposed action will increase the value of the experiment

The "after" portion of the pot survey will take place in the treatment area in the second half of March. However, during this period Pacific cod and pollock trawling will still be taking place in the treatment area. The late March period has been chosen for the "after" data collection since Pacific cod trawling typically drops to lower levels at that time. Nevertheless, in the absence of the proposed regulation closing the treatment area waters, some trawling would still be taking place, and there would be potential for a gear conflict between the trawlers and the pot gear used in the experiment. This gear conflict may lead to the destruction of pots.

Any loss of pots caused by the gear conflicts would reduce the number of data observations obtained, and could reduce the power of the statistical tests that would be performed on the data, and thus could reduce the ability of those tests to discriminate between alternative hypotheses. The results of an experiment that had little power to discriminate between the hypotheses would be of limited use in framing fishery regulations.

The purpose of this action

The purpose of the proposed action is to reduce the loss of pots in this experiment, and to increase the statistical power and usefulness of the experimental results as a test of the localized depletion hypothesis.

Market failure rationale

U.S. Office of Management and Budget guidelines for analyses under E.O. 12866 state that

> ...in order to establish the need for the proposed action, the analysis should discuss whether the problem constitutes a significant market failure. If the problem does not

constitute a market failure, the analysis should provide an alternative demonstration of compelling public need, such as improving governmental processes or addressing distributional concerns. If the proposed action is a result of a statutory or judicial directive, that should be so stated.[2]

The living marine resources of the U.S. EEZ are an asset, held in common by and for the benefit of the American people. NMFS manages these resources under (among other laws) the MSA and ESA, in order to maximize the net benefit to the Nation from their conservation and exploitation. At present, the Pacific cod commercial fishery, in the Bering Sea, is managed as a "derby fishery", meaning there are no market-based mechanisms (e.g., individual property rights to the fish, IFQs, etc.) in place to rationalize fishing behavior. In the absence of such market-based mechanisms (i.e., in the face of this "market failure"), NMFS' ability to, in this instance, exclude fishing activity in the treatment area over the duration of the experiment, except by direct regulation, is severely limited. Ultimately, this regulatory action is necessary to reduce the costs and increase the effectiveness of rules implemented under the MSA and ESA to protect the population of Steller sea lions, in the face of this "common-property" induced market failure.

5.5 Alternatives considered

This action is a closure of specified waters to fishing during the experiment by the Alaska Fisheries Science Center (AFSC). The experiment itself is not the action under consideration, and will proceed whether or not the regulation is adopted. The four alternatives are described below in Table 5.5-1. The areas under consideration were shown earlier in the map in Figure 5.5-1

Four alternatives are examined in this analysis.

- Alternative 1 is the status quo and no action alternative. Under Alternative 1, the experiment would proceed with no closure of the treatment area.
- Alternative 2 is a "trawl closure" option. Under Alternative 2, the treatment area would be closed to all trawling for the second half of March to avoid gear conflicts while the experimental pot fishing is taking place.
- Alternative 3 is an "all gear" closure. Alternative 3 would close the treatment area to longlining and pot fishing as well as to trawling. This option would prevent longlining and pot fishing from growing in the treatment area once the trawl fishermen are no longer operating there. Other fishing, and particularly longlining, could affect the catch rates for the experimental Pacific cod pots. Alternative 3 does not close the treatment area to jigging.
- Alternative 4 is the preferred alternative. Alternative 4 is a general closure for a modified closure area (not the quarter-arc), restricting both trawl and fixed-gear fishing (other than jigging) in the closed area. Alternative 4 modifies the "quarter-arc" closure area so as to reduce the potential burden on trawling operations, without affecting the scientific value of the experiment.

[2]Memorandum from Jacob Lew, OMB director, March 22, 2000. "Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements," Section 1.

Table 5.5-1 Description of the alternatives

Alternative 1	No Action / Status Quo	The experiment proceeds in 2003, 2004, 2005, and 2006 with no closure of the treatment area.
Alternative 2	Treatment Area Closure	The experiment proceeds in 2003, 2004, 2005, and 2006. In each of these years, no trawling would be permitted in waters located west of 164.56.80 W long. and north of 54.34.30 N. lat. and located from 10 nm to 15 nm from the haulout at Cape Sarichef, 164.56.8 W long. and 54.34.30 N. lat., between March 15 and 31. Regulations at 50 C.F.R. 679 would be amended to accomplish this.
Alternative 3	General Closure	The experiment proceeds in 2003, 2004, 2005, and 2006. In each of these years, no trawling, longlining or pot fishing would be permitted in waters located west of 164.56.80 W long. and north of 54.34.30 N. lat. and located from 10 nm to 15 nm from the haulout at Cape Sarichef, 164.56.8 W long. and 54.34.30 N. lat., between March 15 and 31. This additional restriction would not apply to jigging. Regulations at 50 C.F.R. 679 would be amended to accomplish this.
Alternative 4	Modified closure area *(The preferred alternative)*	The experiment proceeds in 2003, 2004, 2005, and 2006. In each of these years, no trawling, longlining, or pot fishing would be permitted in waters located within a quadrilateral bounded by the four points: (1) 54 30 N 165 14 W, (2) 54 35 N 165 26 W, (3) 54 48 N 165 04 W, and (4) 54 44 N 164 56 W, and outside of an arc drawn 10 nm from Cape Sarichef., between March 15 and 31. This additional restriction would not apply to jigging. *Note that this alternative differs from Alternative 3 only in the dimensions of the closed area. It excludes certain deeper waters included by Alternative 3, includes certain waters at the southern end of the closed area in Alternative 3 that are not included by that alternative, and excludes certain waters at the northern end of the closed area in Alternative 3.* Regulations at 50 C.F.R. 679 would be amended to accomplish this.

5.6 Description of fishery

Detailed descriptions of the BSAI groundfish fishery

As noted earlier in the EA, detailed descriptions of the social and economic backgrounds of the groundfish fisheries may be found in the following reports:

Alaska Groundfish Fisheries. Draft Programmatic Supplemental Environmental Impact Statement (NMFS, 2001a). This report contains detailed fishery descriptions and statistics in Section 3.10, "Social and Economic Conditions," and in Appendix I, "Sector and Regional Profiles of the North Pacific Groundfish Fisheries."

"Economic Status of the Groundfish Fisheries off Alaska, 2000" (Hiatt, Felthoven and Terry, 2001), also known as the "2001 Economic SAFE Report." This document is produced by NMFS and updated annually. The 2001 edition contains 49 historical tables summarizing a wide range of fishery information through the year 2000.

Steller Sea Lion Protection Measures Final Supplemental Environmental Impact Statement (NMFS, 2001b. Referred to as "SSL SEIS" in the remainder of this section) contains several sections with useful background information on the groundfish fishery (although the majority of information provided is focused on three important species - pollock, Pacific cod, and Atka mackerel). Section 3.12.2 provides extensive background information on existing social institutions, patterns, and conditions in these fisheries and associated communities, Appendix C provides extensive information on fishery economics, and Appendix D provides extensive background information on groundfish markets.

Final Environmental Impact Statement for American Fisheries Act Amendments 61/61/13/8 (NMFS 2002) provides a survey of the Bering Sea and Aleutian Islands groundfish fishery paying particular attention to the pollock fishery and the management changes introduced into it following the American Fisheries Act. The information is contained in Section 3.3, "Features of the human environment."

A note on harvest data[3]

The description of the fishery in this section depends on data collected by the State of Alaska through its fish ticket system, and on data collected by the Federal government through Weekly Processor Reports (WPRs) and observer reports. Fish ticket data (covering catcher vessels delivering to port) are organized by Alaska State statistical reporting area, while Federal data (for catcher-processors) are organized by the larger Federal statistical reporting areas.

The areas within which fishing would be restricted under these alternatives are shown in Figure 5.5-1, and lie along the northwest side of the area closed to Pacific cod and pollock trawling around Cape Sarichef. This area is much smaller than the Alaska State statistical area 655430 within which almost all of it occurs, and also smaller than the associated Federal reporting area. Alternatives 2, 3, and 4 also include very small portions of Alaska State statistical areas 655410 and 645434. Catch data from these areas are not included in the analysis as these areas are very small in proportion to their statistical areas and because observer data indicate insignificant amounts of groundfish fishing takes place in the portions of the treatment area in these statistical areas See figure 1.1-3 and Appendix figure A4-2.

Given the small size of the treatment area in relation to the statistical area 655430, it has not been possible to estimate the appropriate amounts of fish harvested from it with any confidence. The lowest level of aggregation used for data in this report is the Alaska State statistical area. State fish ticket data are organized on this basis. Estimates of harvests for the catcher-processors from State stat area 655430 have been made from Federal data for the Federal reporting area within which Area 655430 occurs (this

[3]See Section 5.13 for a more detailed discussion of the data sources.

is Federal area 517). The observer data mapped in Appendix A shows that much of the fishing activity in Area 655430 takes place outside the treatment area. Because significant Pacific cod fishing takes place within Area 655430, but outside the treatment area, the reported harvests and numbers of vessels for Area 6655430 are larger than those for the treatment area. The amount by which Area 655430 harvests exceed the treatment area harvests is unknown, although it is believed to be significant.

Dates of actual harvest are only known for observed hauls of fish. However, much activity by this fleet is unobserved. Most of these vessels have only 30% observer coverage. Harvest data during the closed period have been estimated using the volumes of deliveries made in weeks with week ending dates that included some days within the March 15 to March 31 period. This approach to estimating the period during which landings occurred tends to introduce an upward bias in the harvest and vessel count estimates. A week that ends on March 17 may include several days of landings before March 15; a week ending on April 4 may include several days of landings afterwards.

These upward biases in the harvest estimate are due to the level of spatial and temporal detail required by the analysis. The estimation tools are "blunt instruments," not capable of making precise estimates of harvests in this small treatment area during this short period.

Activity in Area 655430 in the second half of March

Appendix A shows that the treatment area is at the far western end of a popular fishing area. This area, referred to as "cod alley" in the EA, stretches to the Northeast, several miles off of the north coast of the Alaska Peninsula.

Figure 1.1-2 superimposes the location of the treatment area over a bathymetric map of the seafloor. The treatment area lies over a fairly broad plateau 70 to 90 meters deep, that runs from the north side of Akun Island across the top of Unimak Pass. As the bathymetric map shows, this plateau lies on the southeastern slope of the tip of the "horseshoe" fishing area. To the southeast, the slope of the horseshoe is much steeper and there is much less Pacific cod trawling activity. To the northeast, the slope into the horseshoe appears to be even less steep, and there is considerable trawling activity.

Medium sized (60-125 foot) bottom trawlers targeting Pacific cod and delivering them to shoreside processors were the most important element in the fleet fishing for groundfish in Alaska statistical area 655430 during the second half of March from 1998 to 2001. The relative size of this fleet decreased, however, during this period. Vessels of this description harvested 78% of the groundfish from the statistical area in 1998, but their share declined to 31% in 2001. As shown in Table 2.3-1, this decline is paralleled by an overall decline in harvests from this area over the period. It was, in fact, the decline in the harvests by this class of vessel that accounted for most of the decline in overall harvest from the area (NMFS Alaska Region Catch by Vessel data set).

The smaller numbers of vessels in 2000 and 2001, and potential confidentiality issues, make it difficult to characterize the changes in the fleet. However, as harvests by the vessels described above declined, harvests by vessels with other characteristics became relatively more important. Catcher-processors became more important in 2000 and 2001. Pot gear in particular became important in 2001, accounting for a third of the harvest that year. Harvests from vessels targeting Pacific cod declined somewhat, but remained high. (NMFS Alaska Region Catch by Vessel data set).

Table 5.6-1, below, shows the estimated numbers of vessels fishing in Alaska statistical area 655430 in the second half of March, by the gear type used, for the period 1998-2002. Bottom trawlers were the most numerous component of the fleet during this period. These are estimated vessel counts for statistical area 655430, and are likely to exceed the numbers of vessels that fished in the treatment area.

Table 5.6-1 Numbers of vessels fishing groundfish in Alaska statistical area 655430 in the second half of March by year and by gear type

Alaska statistical area	Year	Hook and line	Bottom trawl	Pots	Mid-water trawl	Unidentified trawl
655430	1998	1	52	1	0	13
	1999	3	54	0	0	7
	2000	3	23	0	0	8
	2001	7	26	5	0	1

Notes: These are estimates of vessels fishing in Alaska statistical area 655430, and will provide high estimates of the numbers of vessels fishing in the treatment area.
Sources: Pacific States Marine Fisheries Commission, Alaska Fisheries Information Network (PSMFC, AKFIN) 8-30-02

Table 5.6-2 shows, that the groundfish production from the vessels operating in Area 655430 in the second half of March was overwhelmingly Pacific cod. The table also shows that Pacific cod production declined by a large amount from relatively high levels in 1998 and 1999 to lower levels in 2000 and 2001. These are estimated volumes of fish for statistical area 655430 as a whole, and will exceed the amounts of fish taken from the treatment area.

Table 5.6-2 Groundfish harvests from Alaska statistical stat area 655430 in the second half of March by year in metric tons

Year	Pacific cod	Pollock	Other Groundfish
1998	1,924	123	124
1999	2,012	188	98
2000	810	207	106
2001	973	47	147

Notes: These are estimates of the volume of harvest in Alaska statistical area 655430, and will provide high estimates of the volume of harvest in the treatment area.
Source: PSMFC, AKFIN, 8-30-02

Table 5.6-3 shows, the value of groundfish production from Area 655430 in the second half of March. This table shows estimates of the revenues accruing to the vessels (including ex-vessel revenues to the catcher-vessels, and first wholesale revenues to the catcher-processors). The table also shows the first wholesale value of the entire harvest to shoreside processors and to catcher-processors. The first

wholesale value of the entire Area 655430 harvest ranged between $1.24 million and $2.67 million per year. The value received by vessel operators ranged between $0.74 million and $1.15 million. Average harvest values in 2000 and 2001 were lower than those in 1998 and 1999. These are estimates of value for statistical area 655430 as a whole, and will exceed the values taken from the treatment area alone.

Table 5.6-3 Vessel level and processor level gross revenues from fishing groundfish in Alaska statistical area 655430 in the second half of March

Year	Total bottom trawler fleet revenues (millions of dollars)	Total other gear fleet revenues (millions of dollars)	Total first wholesale revenues received by catcher-processors, motherships, and on-shore processors (millions of dollars
1998	$0.61	$0.13	$1.72
1999	$1.02	$0.13	$2.67
2000	$0.44	$0.29	$1.24
2001	$0.42	$0.27	$1.27

Notes: Bottom trawler and other gear revenues calculated using ex-vessel prices for catcher vessels, and first wholesale prices for catcher-processors. These are estimates of the value of harvest in Alaska statistical area 655430, and will provide high estimates of the value of harvest in the treatment area. The "other gear revenues" include unidentified trawlers in 1998-2000, and may thus include some bottom trawl revenues. Total first wholesale revenues and bottom trawl and other gear revenues are not additive.
Source: PSMFC, AKFIN 8-30-02

Second half of March activity in comparative perspective

Table 2.3-2 shows the estimated catch by weight from the BSAI, by Federal statistical reporting area, for the first half of the year from 1999 to 2002. Table 2.3-2 shows that Federal statistical reporting Area 517, within which the treatment area falls, accounted for between about 16% and about 36% of total BSAI groundfish landings in the first halves of these years. It accounted for between about 12% and about 26% of total annual Pacific cod harvests from the BSAI in the same period.

The amounts in Table 2.3-2 are harvest estimates by quarters for the fishing years 1999 through 2002. The proposed action will only affect fishing activity during the period from March 15 to March 31. Table 5.6-4 shows harvests from Area 517 during the second half of March, and contrasts them with harvests from all of the BSAI during the second half of March, and from all of the BSAI during the first half of the year. From 1998 to 2002, Pacific cod harvests from Area 517 accounted for between about 13% and about 25% of total the second half of March landings from the BSAI. From 1999 to 2002, these landings accounted for between about 2% and 5% of total Pacific cod landings for the first half of the year.

Table 5.6-4 Second half of March Pacific cod harvests from Federal statistical reporting area 517, 1998-2002.

Year	Second half of March harvests in Area 517 (metric tons)	Second half of March harvests in BSAI (metric tons)	Second half of March Area 517 harvests as a percent of BSAI harvests in late March	January to June BSAI harvests from Table 2.3-2 (metric tons)	Second half of March Area 517 harvests as a percent of January to June harvests in BSAI
1998	6,132	39,001	15.7%		
1999	7,268	34,063	21.3%	134,970	5%
2000	6,816	27,854	24.5%	134,121	5%
2001	1,853	14,808	12.5%	102,159	2%
2002	3,990	26,531	15.0%	129,938	3%

Notes: These estimates overstate late-March harvests somewhat, since they include landings from all statistical weeks that include some days from the period from March 15 to March 31.
Source: NMFS-AKR In-season management; calculated from Table 2.3-2.

Table 5.6-5 shows how Area 655430 harvests compare to total BSAI harvests in the second half of March. It is also of interest to compare Area 655430 harvests for the vessels that operated there in the second half of March, with other harvests by only these vessels outside of the Area 655430 during the second half of March. Table 5.6-5 makes this comparison for the volume and the first wholesale value of Area 655430 harvests for these vessels. The volumes from this area ranged between 17.2% and 27.8% of the groundfish harvests for these vessels at this time.

Table 5.6-5 Groundfish harvests from Area 655430 in the second half of March as a percent of harvests from other areas in the second half of March for vessels fishing in Area 655430 in the second half of March

Year	Percent of groundfish metric tons from Area 655430	Percent of vessel revenues from Area 655430 activity
1998	17.2%	13.9%
1999	27.8%	21.1%
2000	11.41%	10.2%
2001	10.39%	11.66%

Notes: Vessel level revenue estimates are based on ex-vessel revenues for catcher vessels and first wholesale revenues for catcher-processors.
Source: PSMFC, AKFIN 8-30-02

Table 5.6-6 shows the numbers of vessels that fished in Area 655430 in more than one year during the four year period from 1998 to 2001. Of the 113 separate vessels that fished in Area 655430 during this four year period, over half, 58, fished in the area in no more than one year. Over three-fourths only fished there in two of the four years. Note, again, that these statistics encompass activity in all of Area 655430, a much larger reporting district than that proposed for fishing restrictions under this action, so these estimates are almost certainly overstate harvests from the area affected by the action.

Table 5.6-6 Numbers of vessels fishing groundfish in Alaska statistical area 655430 in the second half of March in more than one year, 1998-2002

Number of years	Number of vessels active in Alaska statistical area 655430 this many years from 1998-2001
1	58
2	28
3	16
4	11

Notes:
Sources: PSMFC, AKFIN 8-30-02

Communities affected by the fishery

As shown below in Table 5.6-7, catcher vessels delivering inshore deliver their products to Akutan, Unalaska/Dutch Harbor (Unalaska), or King Cove. The number of firms taking delivery of the fish in each community is fewer than four, and this makes it impossible to distribute information about the location of these deliveries without violating Alaska and Federal confidentiality requirements. The data in Table 5.6-8 is therefore not broken out for the separate communities. It is permissible to say that deliveries to Akutan and Unalaska are higher than those to King Cove.

Detailed descriptions of Akutan, Unalaska, and King Cove may be found in the regional profiles prepared by Northern Economics for the Programmatic Groundfish SEIS under preparation by NMFS. These profiles are available on the Internet web site of the North Pacific Fisheries Management Council at http://www.fakr.noaa.gov/npfmc/NorthernEconomics/NorthernEconomics.htm .

Akutan is a small Aleut community of about 100 persons located on the north side of Akutan Island in the Aleutians, about 50 miles to the west of the treatment area. Akutan's location is shown in Figure 5.6-1. Akutan's actual 2000 census population is 713, but most of these persons live in the group housing connected with a nearby fish processing plant. The profile of Akutan developed for the groundfish SEIS notes that "Akutan, while deriving economic benefits from the presence of a large shoreplant near the community proper, has not articulated large-scale commercial fishing activity with the daily life of the community. While US Census figures show Akutan had a population of 589 in 1990 and 713 in 2000, the Traditional Council considers the "local" resident population of the community to be around 80 persons, with the balance being considered "non-resident employees" of the seafood plant. This definition, obviously, differs from census, state, and electoral definitions of residency, but is reflective of the social reality of Akutan." (Regional Profiles, page 537-538). Harvests from the treatment area are believed to have little impact on residents of Akutan.

Unalaska lies on the eastern end of Unalaska Island, about 35 miles west of Akutan and about 80 to 90 miles from the treatment area. Its location may be seen in Figure 5.6-1. The Unalaska economy is based on fishing, fish processing and transportation, and support services for the groundfish and crab fisheries, and to a lesser extent, halibut and salmon. Unalaska is arguably the most important fishing port in the United States; it routinely has the largest landings in volume, and for many years had the largest landings in value. In 2000, the estimated wholesale value of the fish products processed here was about $139 million dollars (Regional Profiles, page 520).

The U.S. census estimated the 2000 population of Unalaska at 4,283. The Regional Profile notes that, in addition to the year-round population, Unalaska has a "floating" population composed of crew members of "fishing fleets, floating processors, catcher/processors, and freighters that stop at the port of Unalaska for resupply." In 1990 this floating population was estimated at about 18,000 persons. (Regional Profile, page 511). The Regional Profile also notes, on the basis of field interviews, that Unalaska's population may have declined somewhat in 2001 and 2002 due to rationalization of pollock fisheries following the introduction of the American Fisheries Act (AFA). "Anecdotal evidence cited by interviewees included less participation in city-sponsored recreational sports...and an easing of the shortage of housing..." (Regional Profile, page 514).

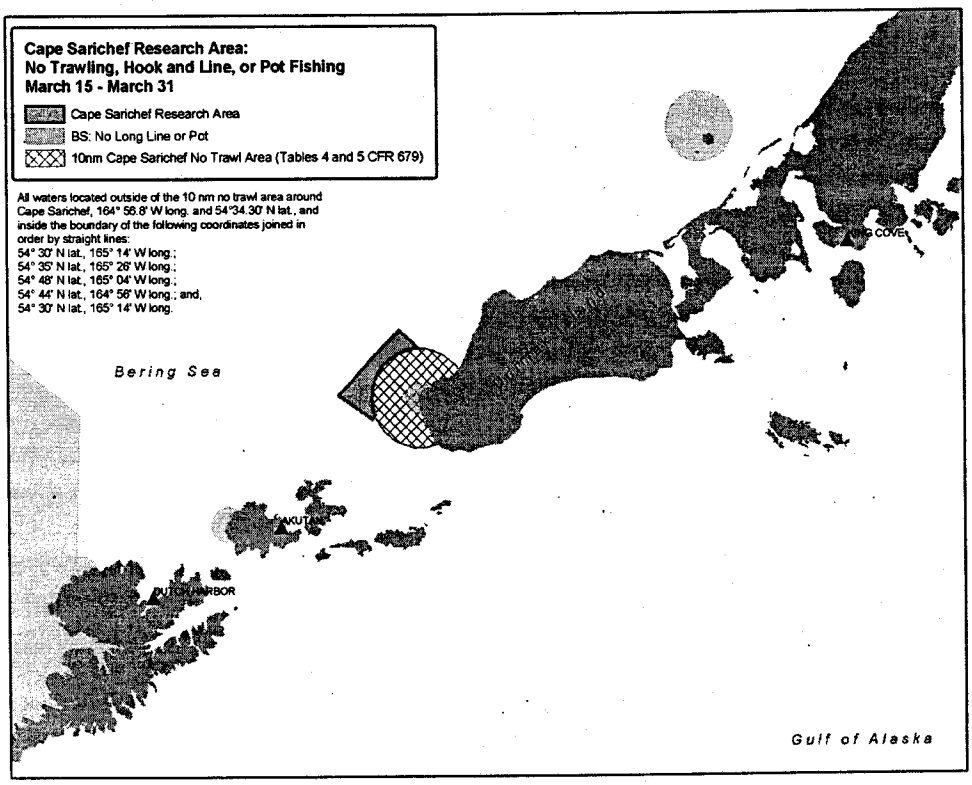
King Cove is located to the east of the treatment area on the south side of the Alaska Peninsula. The Alaska Department of Community and Economic Development describes King Cove as dependent "...almost completely on the year-round commercial fishing and seafood processing industries." The Regional Profile notes that King Cove differs from Akutan in that the processing plant is much more integrated into the fabric of the community, and it has a resident fishing fleet delivering to the local seafood processor (Regional Profile, page 540). With respect to the King Cove processing plant, the Regional Profile notes, "The King Cove plant processes a good amount of crab and has developed groundfish processing capability, with Pacific cod as the predominant species, and with significant amounts of cod being supplied from both the GOA and BSAI regions. The plant also processes a large amount of salmon, and some herring and halibut."(Regional Profile, page 544).

Table 5.6-7 Location and volume of deliveries of unprocessed groundfish harvested in Alaska statistical area 655430 in the second half of March, 1998-2002

Year	Communities with deliveries	Volume from Area 655430 (mt)	Value from Area 655430 (Millions $)	Volume from all stat areas in the second half of March (mt)	Area 655430 as a percent of total volume
1998	Akutan, King Cove, Unalaska	1,973	$1.60	8,460	23%
1999	Akutan, King Cove, Unalaska	2,143	$2.55	8,574	25%
2000	Akutan, King Cove, Unalaska, floaters	840	$0.95	18,053	5%
2001	Akutan, King Cove, Unalaska, floaters	728	$0.86	46,453	2%

Notes: The small numbers of buyers make it impossible to report community deliveries separately. The large increase in overall volume from all statistical areas in 2000 and 2001 is due to increases in pollock deliveries in those years.
Source: PSMFC, AKFIN 8-30-02

Figure 5.6-1 Communities where groundfish from the proposed closure area are landed



There are significant racial and cultural minority populations in the three communities in which groundfish have been landed from the treatment area. The percentages of the population in each community claiming membership in one of six racial groupings on the 2000 Federal census is shown in Table 5.10-1. The principal minority populations identified include Alaska Natives and Asians (predominately people of Filipino origin).

As noted earlier, Akutan is actually a composite "community." Fish are delivered to a processing plant near the town, but the town has little interaction with the plant or the fishing vessels that deliver fish to it. The census population estimates lump the population of the town with the population in group housing at the processing plant. Therefore, the actual Alaska Native population percentage of the town itself is probably understated by the estimate in Table 5.6-8.

Table 5.6-8 Percent of the population claiming membership in six racial groups on the 2000 census in Unalaska, Akutan, and King Cove

Community	White	Black	Native	Asian	Pacific Islanders	Other
Akutan	17.8	1.6	47.9	28.8	0.6	7.2
Unalaska	25.0	2.1	16.4	39.4	0.3	18.4
King Cove	47.3	4.0	9.3	32.5	1.0	10.3

Notes: Percentages in a community may sum to more than 100 since persons may belong to one or more racial groups.
Source: 2000 Census

Table 5.6-9 summarizes information on income levels, and poverty populations in Akutan, Unalaska, and King Cove.

Table 5.6.9 Low income populations in Akutan, Unalaska, and King Cove

Community	Per capita income	Median household income	Median family income	Persons in poverty	Percent of the population below the poverty line
Akutan	$12,259	$33,750	$43,125	297	45.5%
King Cove	$17,791	$45,893	$47,188	97	11.9%
Unalaska	$24,676	$69,539	$80,829	533	12.5%
State of Alaska	$22,660	$51,571	$59,036	57,602	9.2%

Notes:
Sources: Alaska Department of Community and Economic Development; 2000 U.S. Census

Another way to look at community dependency is to assign earnings from harvests to the communities where the owners of the vessels used in the fishery reside. Due to confidentiality restrictions, harvests by vessel owner community are not reported here, but Table 5.6-10 does report the value of harvest by state of reported residency of vessel owner. Most of the harvest in each year is taken by vessels whose owners reside in Washington, and to a lesser extent, in Oregon. California, Maine, and Alaska are other states

with resident vessel owners whose vessels are active in this area. Vessel owners from Alaska do not have a big presence in this area. Table 5.6-11 below shows the communities in each state with vessel owners who operate in this area.

Table 5.6-10 Alaska statistical area 655430 vessel groundfish harvest values in the second half of March by state of residence of vessel owner

Year	Washington	Oregon	Other and unknown
1998	$434,000	$185,000	$122,000
1999	$1,029,000		$111,000
2000	$410,000	$305,000	
2001	$478,000	$210,000	

Notes: All estimates rounded to nearest $1,000. Revenues include ex-vessel revenues for catcher vessels, and first wholesale revenues for catcher-processors. The "Other and unknown" category includes harvests by vessels with owners resident in Alaska, California, and Maine, and by vessels whose owner's residence is unknown. Oregon revenues have been combined with Washington and other state revenues, depending on year, to preserve data confidentiality.
Sources: PSMFC, AKFIN 8-30-02

Table 5.6-11 Communities with resident vessel owners whose vessels are active in the treatment area (Alaska statistical area 655430).

State	Communities
Alaska	Homer, Kodiak, Petersburg, Seward, Unalaska
California	Half Moon Bay, San Francisco
Maine	Rockland
Oregon	Astoria, Newport, Prineville, Seal Rock, Siletz
Washington	Aberdeen, Anacortes, Bainbridge Island, Bellingham, Blaine, Bothell, Duvall, Edmonds, Friday Harbor, Lynnwood, Mill Creek, Oysterville, Seattle, Shoreline, South Bend, Westport

Notes: The owner's home was unknown for one vessel.
Source: PSMFC, AKFIN 8-30-02

5.7 Benefits of the alternatives

As noted in Section 5.2, "Purpose and need for action," the past 20 years have seen large declines in the population of the western distinct population segment (DPS) of the Steller sea lion. This population of the Steller sea lion has been listed as endangered under the Endangered Species Act (ESA). Depletion of stocks of sea lion groundfish prey by commercial fishermen near the Stellers' haulouts and rookeries ("localized depletion") has been identified as a possible cause. The principal groundfish species of concern are pollock, Atka mackerel, and Pacific cod.

Fishing regulations implemented with the 2002 fishing year have imposed restrictions on commercial fishing for pollock, Pacific cod and Atka mackerel near rookeries and haulouts. These restrictions are

believed to be expensive for industry. The RIR prepared at the time the restrictions were under consideration, estimated that the total annual value of Pacific cod formerly taken from the waters now to be restricted was on the order of $21 million per year in the BSAI and GOA. The value taken by trawl gear was $6 million per year.[4] While much of this gross value was undoubtedly offset by changes in fishing patterns: (a) not all of it may have been, (b) it was likely done at increased cost, and (c) the burden is widely believed to have fallen more heavily on small entities which are less able to travel further from port.[5] Moreover, the regulations imposed in 2002 were controversial. Many believe the appropriate regulations should be more restrictive. One alternative under consideration at that time would have restricted waters from which Pacific cod, annually worth an estimated $48 million, were taken ($28 million a year worth of trawl fish). (NMFS, 2001(c), pages C132-C140.)

The Alaska Fisheries Science Center (AFSC) is conducting an experiment in January and March 2003 to test the hypothesis of localized depletion of Pacific cod by trawl gear in an area to the northwest of Cape Sarichef. In addition, the experiment should provide information on seasonal and spatial distributions of Pacific cod in the area of Unimak Pass, and on the feasibility of the use of pot gear in future scientific studies of this type. The AFSC is seeking funding to continue the experiment in the years 2004 to 2006.

The test of the localized depletion hypothesis is the most important information expected from this experiment. The information will be valuable if it allows managers to make decisions that will increase the value of the economic and ecological benefits provided by the BSAI and GOA groundfish fisheries.

This proposed action is designed to enhance the value of the experiment by increasing the power of the statistical tests.

The mechanics of the experiment

The experiment is described in detail in Appendix A. Study locations or sites will be distributed randomly or systematically over both the treatment and control areas, with approximately half of the sites in each zone. Each site will be fished with a single pot on 3-5 different days over the course of a 16-day survey; the measured unit for the site will be the average cod catch over these days. This averaging provides a smoothing effect for nuisance variability in the catch data due to tides and short-term temporal changes. The same sites fished during the "before" survey in January will be fished again during the "after" survey in late March. The quantity of interest is the percentage change in fish abundance at each site, measured as the ratio of the average cod catch during the "after" survey to the average from the "before" survey. The goal of the study is to perform a nonparametric hypothesis test of whether this percentage change is the same over both the treatment and control zones.

The goal for the 2003 experiment, based on results from the pilot study, is to survey 60 sites in each of the two zones (treatment and control). It is anticipated that between 30 and 50 pots will be launched and lifted each working day, depending on weather and sea conditions. At an average rate of 40 pots/day, with a total of 120 sites to be fished, each survey will require 10-15 working days. There are 16 days from March 16 to March 31. It is expected that at least 1 or 2 days will be lost to poor weather. Thus,

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[4]The Pacific cod and trawl estimates are presented here because the proposed experiment would examine the impact of Pacific cod trawling on localized depletion.

[5]This is discussed extensively in the RIR that accompanies the EIS. See also Section 5.7 of this RIR.

the entire period of the requested closure will be needed to perform the "after" survey during March. Some research fishing within the closure area is anticipated for every day of the closure period.

If the regulation does not go into effect, 60 sites and up to 300 pot-sets will be vulnerable to perturbation by trawlers. Occasional pot loss will reduce the number of fishing days that contribute to the average for each site, increasing the variance of the measured cod catch. Loss of pots on multiple fishing days can potentially reduce the number of observations at a site to less than three, which would result in the entire site being lost and the sample size for hypothesis testing reduced. Sample sites that are lost to trawlers in March will effectively cause the loss of the sampling done at the corresponding stations before the fishery as well as the loss of the sample unit in the March survey.

Possible pot losses without the regulation

It is impossible to know in advance what the pot loss rate would be without the regulation. It is likely to be high. The treatment area is relatively small and the number of stations is relatively large, so it is likely that the pots will crowd the trawled experimental region enough to make it impossible for trawlers to completely avoid the pot gear. For the purpose of discussion, two levels of pot loss are examined. The two rates of daily pot loss considered here are 20 percent and 50 percent.

Assuming an average of 40 experimental pots fished each day, with half in the treatment area, a 20% loss rate translates into the loss of four pots a day. The impact will depend on the distribution of these losses over the study sites and the repeated fishing days. At one extreme, in which sample unit loss is minimized and the losses occur at different sites, a number of sample units would have their number of pots reduced from 5 to 4 or 3 over the course of the survey. Over 15 fishing days all 60 sample units could have their number of pots reduced by 1, with an associated increase in the variance of the resulting average catch. At the other extreme, in which pot loss occurs repeatedly at the same sites, anywhere from 4 to 20 sites could be lost entirely. Both an increase in the variance of the measured quantity and reduction in the number of study sites would adversely affect the power of the hypothesis test, and increase the risk that the experimental results will be inconclusive.

A 50% rate corresponds to a loss of 10 pots per day. Over 15 fishing days at least 10 sample sites would be lost, with the remaining 50 sites weakened from 5 to 3 fishing-days apiece. At the other extreme, the number of sampling sites could be cut to 30 sites, each represented by the full 5 fishing days. Either scenario, and all of the possibilities in between, would increase in the variance of the measured catch and decrease the sample size of the hypothesis test, making it likely that the test would be unable to definitively identify any fishing effect.

The potential value of the experimental results

Despite the significant restrictions on groundfish fishing in Steller critical habitat that were incorporated into the fishery regulations (and even more restrictive measures have been and continue to be considered) there is very little concrete information on localized depletion. This experiment is designed to help fill the information gap. So far no experiments have been conducted to test the hypothesis of localized depletion in Pacific cod.

This experiment is part of a larger program of research. The Alaska Fisheries Science Center has already completed two years of a projected multi-year study of the impact of fishing activity on pollock stocks in the GOA south of Kodiak Island. In this study, Chiniak Trough is being used as a control site in which

trawl fishing is prohibited, while Barnabas Trough is being used as a treatment site in which trawl fishing is allowed. Echo integration-trawl (EIT) surveys are conducted in each trough before and after trawl fishing is allowed in the Barnabas Trough. Pollock patterns in the two Troughs would then be compared to determine whether or not trawling had affected the Barnabas pollock stock. Analytical work is conducted in August. As this is written (July 2002) complete "before and after" analysis has only been completed for 2001. A preliminary analysis of the 2001 results says that, "Preliminary results from the second year, when the commercial fishery took place within this study area, have yet to suggest a significant link between fishing activities and changes in adult and age-1 pollock geographical distribution, biomass, vertical distribution, or school fractal dimensions."[6] (Wilson *et al.*, page 14.)

The Chiniak study will provide important information about localized depletion of pollock stocks, and this information will undoubtedly be generalizable to other contexts. However, the Chiniak study deals only with pollock, and pollock is only one of three species of principal concern with respect to Steller sea lion and fishery interactions. Pacific cod and pollock are different species with different behaviors. Pollock results can't be generalized to Pacific cod.

This research project will provide information on localized depletion of Pacific cod by trawl gear in an important trawl fishing area. The test will show whether or not an index of Pacific cod abundance, based on data collected with pot gear, shows a decline between a time immediately before trawling commences, and a time immediately after a period of intense trawling. If localized depletion is detected, subsequent years' research may also look at the speed with which in-migration of cod offsets the depletion. This research project will not examine the response of the Steller populations to localized depletion of Pacific cod. While this research addresses the impact of trawling on cod depletion near Cape Sarichef, information gathered may be generalizable to other fishing areas located near haulouts and rookeries.

Better information on seasonal and spatial distributions of Pacific cod

In addition to the designed objective, this study may provide valuable information on small- to intermediate-scale spatial variability of Pacific cod during the winter spawning season. The localized depletion study provides a platform for sample collection and observation of spawning cod that is not available from regular summer surveys. Investigations already underway in connection with the study include collection of length frequencies, sex ratios, and maturity data from cod on spawning grounds; sample collection for proximate analysis and fecundity studies of cod at different ages and spawning states; and a tagging program to collect information on both small-scale movements during spawning season and long-range seasonal movements in models of Steller sea lion foraging. Expanded knowledge of spawning habitat and behaviors may also improve stock assessment modeling and management of the BSAI Pacific cod.

The cost of lost pots

In addition to the increase in sample variance, pot loss rates at these levels imply fairly large costs for pot loss. The research pots are more expensive than normal Pacific cod pots. The cost of fabricating, rigging, and shipping a research pot is about $1,460.

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[6]"School fractal dimensions" refers to the relationship between the surface area of the school and its volume.

At a 20% loss rate, 4 pots would be lost per day for 14 days for a total of 56 pots lost. This implies a pot loss cost of $81,760. At a 50% loss rate, 10 pots would be lost per day for 14 days so that 140 pots would be lost. This implies a pot loss cost of $204,400. Associated costs will also be due to lost charter time required to handle such large numbers of pots. There will be extra trips and associated loading times when it is necessary to run to the holding grounds to collect replacement pots.

It is also likely that, when a trawler snags a pot in its net, there are associated costs, as well. Expensive nets may be damage. Fish contained in the trawl may be damaged or lost. Additional costs will almost certainly be incurred to retrieve the trawl, disentangle the fouled pot(s), buoy(s), and/or lines. Even the process of avoiding pot sets may impose operating costs, as haul duration, course, or speed may have to be altered, unexpectedly, to avoid fouling. While quantitative estimates of these costs cannot be offered, given available information, awareness of their potential, and associated effects on the trawl fishing sector, provides additional justification for the proposed action.

Relative benefits of the alternatives

Alternative 1 is the no action and status quo alternative. No restrictions would be placed on fishing in the treatment area. Trawling is expected to interfere with the experimental pot fishing, reducing the power of the statistical tests of the localized depletion hypothesis.

Alternative 2 closes an "arc-shaped" treatment area to trawling, but leaves the treatment area open for longlining and pot fishing. Under this alternative, the experimental pots would be protected from damage by the trawlers. This should increase the statistical power of the experiment. However, there are concerns that the closure of this area to trawling will lead to an increase in the use of commercial hook-and-line and pot gear in the area. These gears currently are relatively lightly used in the area because of potential gear conflicts with the trawlers. Large removals of cod by fixed gear during this period could result in decreases in local abundance that could be mis-interpreted as a trawl effect in the experiment. This may offset some of the benefits obtained by the trawl restriction. Moreover, the influx of hook-and-line and pot gear raises the prospect of gear conflicts in early April, when the trawl closure is lifted and trawlers seek to reenter the area.

Alternatives 3 and 4 include the restrictions on trawling in the treatment area found in Alternative 2, but add restrictions on fishing for groundfish with hook-and-line or pot gear in the treatment area. These alternatives are designed to prevent fixed-gear vessels from increasing their fishing activity in the treatment area while the trawlers are prevented from fishing there. This will prevent them from making substantial removals of cod from the study area as the "after" leg of the experiment is being conducted, thus removing a potential source of error from the experimental results. These alternatives would also reduce the potential for gear conflicts in April when the trawl closure ends.

Alternative 4 is a compromise solution worked out through consultation between AFSC scientists and industry representatives during the October 2002 Council meetings. Alternative 4 has the same restrictions as Alternative 3, but the shape of the closure area has been modified. The Alternative 4 area leaves open some deeper waters (>100 m) to the north and northeast of the study area that would be closed under Alternatives 2 and 3. These waters are not essential to the experiment, but can provide a working trawl alley for fishermen. Alternative 4 adds some additional shallower waters near the southern end of the Alternative 2 and 3 closure area. These shallower waters were not heavily used by trawlers in late March, but may be useful for fishing experimental pots. Alternative 4 provides the same

benefits as Alternative 3, but, as discussed in the next section, imposes lower costs on industry. Alternative 4 is the preferred alternative.

5.8 Costs of the alternatives

Costs of fishing elsewhere

The most important potential cost of this proposal will be the reduced value of harvests for any vessels that would have operated in the closed area during the second half of March, and for any processors that would have processed these harvests. Vessels that would otherwise have fished in the control area will, presumably, fish elsewhere incurring higher operating costs or reduced revenues.

Table 5.6-3 summarizes information on the estimated revenues earned by fishing vessels and by fish processors from stat area 655430 in the second half of March from 1998-2001. Vessel revenues (ex-vessel revenues for catcher vessels and first wholesale revenues for catcher-processors) ranged from $0.74 million to $1.15 million during this period. First wholesale revenues to all processors ranged from $1.24 million to $2.67 million during this period.

This estimated first wholesale value is expected to exceed the total cost of the proposed closure to the fishing and processing industry for three reasons: (1) it is a measure of gross revenues, and ignores the variable costs of harvesting the fish; (2) the volumes and values reported here have a known upward bias, and (3) because the fishing operations involved will be able to change their fishing patterns and make up at least part of their harvests elsewhere.

First, the estimated first wholesale revenues reported in Table 5.6-3 exceed the social benefits, or the returns to the fishermen and processors, by the variable costs of harvesting and processing these fish. These include the costs of fishing and processing labor, fuel, wear and tear on gear, utilities for the processing plant, and so on. Information on these costs that might have been used to estimate the net returns from the fishing activity in this area is not available.

Second, as Figure 5.5-1 shows, the treatment area (under any of the alternatives) only takes up a small part of the surface area of Alaska statistical area 655430; more importantly, as observer data in Appendix A shows, it is only part of the area within the statistical area where harvesting takes place. During the second half of March, groundfish harvesting is concentrated in the eastern end of the statistical area. The treatment area is located in the southern half of the eastern end of this statistical area. Thus, value of actual harvests from the treatment area will be significantly less than the values shown for the whole statistical area in Table 5.6-3. Moreover, as noted in Section 5.6, the estimation technique used to estimate harvests from the statistical area in the second half of March probably has an upward bias.

Third, the fishing operations that will not be able to fish in the treatment area during the period of the closure will be able to fish elsewhere during that time. Thus they should be able to make up some, perhaps even all of the harvest they would lose in the closure. A long underwater ridge extends parallel to the north side of the Aleutians and Alaska Peninsula. It is fairly narrow north of Akutan and across the mouth of Unimak Pass, and widens north of Cape Sarichef. Much of the trawling that will be impacted is taking place along this ridge. It is likely that if the fishermen compensate for the treatment area closure by fishing elsewhere, they will move to the northeast along this ridge. Alternatively, they may move to the north, and trawl in waters of similar depth on the northern side of the horseshoe. (Conners, pers. comm).

These operations would incur a cost because they had to change their fishing patterns. They have shown that they prefer to do a certain amount of fishing in Area 655430 during this time. This may be because of a higher catch per unit of effort, shorter runs to the processor ports of Akutan, Unalaska, and King Cove, or for other reasons. Whatever advantages this area holds will be lost to them, even if they are able to make up the lost fish by fishing elsewhere. Thus a movement to another location will effectively increase their costs, even if their revenues remain unchanged.

Models of the fishing behavior of these vessels, that would make it possible to predict how they will alter their behavior, are not available. It does seem possible that they will react by shifting their fishing activity to the northeast. As the bathymetric map in Figure 1.1-2 shows, the relatively gentle slope into the horseshoe on which they are fishing extends in that direction. As Appendix A shows, the treatment area is the southeastern end of a long "cod alley" subject to heavy fishing extending to the northeast several miles offshore of the north coast of Unimak Island. As Table 2.3.1 shows, Federal statistical reporting area 509, which is to the east of Alaska statistical area 655430, is an area of heavy Pacific cod fishing activity. A shift of this nature would take the catcher vessels somewhat further from the ports where they deliver the harvest.

Alternatives 3 and 4 may have somewhat higher costs than Alternative 2 since it affects two additional gear types. These costs are likely to be small. As shown in Table 5.6-1, the numbers of hook-and-line and pot vessels operating in the treatment area were small compared to the numbers of bottom trawl vessels in the period from 1998-2001. As shown in Table 5.6-3, other gear revenues (possibly including some unidentified bottom trawl revenues) were about $290,000 in 2000 (the highest annual level during this period). This value would certainly overstate the net cost of Alternatives 3 and 4 compared to Alternative 2 because it does not take account of vessel variable costs, and because these vessels can fish elsewhere during this period.

Potential PSC by-catch issues

Alternatives 2 through 4 may cause trawlers, hook-and-liners, and pot fishermen active in the treatment area in late March to fish in areas along "cod alley" outside and to the northeast of the treatment area. If the location of fishing activity changes, it is possible that by-catches of prohibited species (PSC) may also change. If enough additional PSC species are taken, it is possible that PSC limits may be triggered, leading to closures of directed fishing for Pacific cod. Concerns have been raised about potential by-catches of three species: halibut, red king crab, and *C. bairdi* Tanner crab.

In order to evaluate the potential impact of the closure on by-catches of these three species, late March by-catch rates were evaluated in two related fishing areas. One, a southern area, covered most of the eastern end of Alaska statistical area 655430. Estimates prepared for this area showed by-catch rates in the area in which fishing operations would be forced to fish were somewhat less. By-catch rates were also calculated in a northern area into which more effort might be expected to be directed. This northern area of 655430 covered the lower southwest corner of Zone 1.[7]

[7]The southern area is the area between 54.5 and 55 degrees north latitude and 165 and 166 degrees west longitude; the northern area is the area between 55 and 56 degrees north latitude, and 164 and 165 degrees west longitude. Rates were based on the observed species composition weights extrapolated to the official total catch weights for all non-pelagic trawlers. Rates were estimated at the Alaska Fisheries Science Center.

Halibut by-catches appear to be higher in the treatment area than in the area to the northeast of the treatment area during late March. The mean annual rate in the area in which the fishermen would fish less was 0.0724 kg of halibut per kg of Pacific cod in the years from 1998 to 2002, while the mean annual rate in the area where they would tend to fish more was 0.0351. In each year the southern area had a lower by-catch rate than the northern area. This suggests that a movement of fishing operations to the northeast would tend to reduce the overall BSAI by-catch rate for halibut. At a minimum, it doesn't appear to impose new costs.

There are separate red king crab by-catch limits for Pacific cod fishermen in two different zones of the BSAI. The treatment area falls in Zone 2, while much of the area of "cod alley" to the northeast of the treatment area falls into Zone 1. Each zone has its own PSC red king crab cap. A problem could be created if fishermen who leave the treatment area move into Zone 1 to continue fishing in late March. There is concern that the increased fishing activity in Zone 1 could increase by-catch in late March, and preclude continued Pacific cod fishing later in the year.

As shown in Table 5.8-1, Pacific cod red king crab PSC bycatch in Zone 1 fell short of the caps by about four thousand to ten thousand crabs a year from 1998 to 2001. In 2002, the PSC bycatch exceeded the cap by about 1,100 crabs (the cap was exceeded in June 2002).

Table 5.8-1 Pacific cod trawl red king crab caps and harvests in BSAI Zone 1 (measured in numbers of crabs)

Species	Year	Cap	Crabs	Difference
Red king crab	1998	6,938	3,015	3,923
	1999	14,850	7,752	7,098
	2000	11,656	4,379	7,277
	2001	11,664	1,742	9,923
	2002	11,664	12,724	-1,060
C. bairdi Tanner	1998	65,205	123,232	58,027
	1999	79,148	139,950	60,802
	2000	55,379	154,856	99,477
	2001	44,842	136,400	91,558
	2002	138,690	183,112	44,422

Notes;
Source: NMFS, AKR catch statistics web page: http://www.fakr.noaa.gov/sustainablefisheries/catchstats.htm . Accessed October 10, 2002.

It is possible to suggest the magnitude of red king crab PSC by-catch that might be associated with the closure of the treatment area.[8] This was estimated to be 282 crabs. The assumptions underlying this calculation were deliberately chosen to be conservative. PSC by-catch of this magnitude would not have led to a closure of Zone 1 in any of the years considered. In most years, the harvest was so far below the cap, that the additional crab would not have affected the result; in 2002, the cap was exceeded and the additional harvest of PSC crab would not have affected that result.

It is possible, using a similar approach, to suggest the magnitude of the *C. bairdi* Tanner crab PSC by-catch that might be associated with the closure of the treatment area.[9] By-catch rates for *C. biardi* crab varied considerably. Evaluated at the high and low ends of the estimated annual by-catch rates, estimated *C. bairdi* by-catch increases in Zone 1 ranged between 336 and 3, 191 crab. The assumptions underlying these calculations were deliberately chosen to be conservative. As shown in Table 5.8-1, the actual catches of *C. bairdi* were below the caps by at least 44,000 crabs in each of the years from 1998-2002. It is thus unlikely that increased by-catches associated with this measure would reach the level of the cap and trigger Pacific cod fishing closures.

Relative costs of the alternatives

Alternative 1 is the no action and status quo alternative. No restrictions would be placed on fishing in the treatment area. This alternative imposes no costs on fishing operations.

Alternative 2 closes an "arc-shaped" treatment area to trawling, but leaves the treatment area open for longlining and pot fishing. This alternative imposes costs on trawling operations; these costs are similar to those in Alternative 3, but more than those under Alternative 4 due to the modified treatment area used in that alternative. This alternative may actually induce increased commercial longlining and pot fishing in the treatment area in response to removal of trawling effort, adversely affecting the statistical power of the experiment, and raises the possibility of gear conflicts when the trawl closure ends in April. PSC by-catch is not expected to be a problem under this alternative, or under alternatives 3 or 4.

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[8]The median tonnage from Alaska statistical area 655430 from 1998 to 2001 was somewhat less than 1,600 metric tons during the March 15 to March 31 period. For the purpose of this discussion, assume that all of this tonnage would be taken in Zone 1. Anecdotal evidence suggests that red king crab can weigh between 5 and 6.5 pounds per crab on harvest, depending on stock conditions. To be conservative (and estimate a relatively large number of crab for a given weight) this discussion assumes an average weight of five pounds per crab. The red king crab by-catch rate in late March for an area of Zone 1 close to the treatment area was 0.0004 kg of red king crab per kg of Pacific cod. This information suggests that if all the groundfish harvest forgone in the treatment area was made up in Zone 1 in late March, the number of additional crab that would be harvested in Zone 1 would be 282 crabs.

[9]The median tonnage from Alaska statistical area 655430 from 1998 to 2001 was somewhat less than 1,600 metric tons during the March 15 to March 31 period. For the purpose of this discussion, assume that all of this tonnage would be taken in Zone 1. Anecdotal evidence suggests that *C. bairdi* Tanner crab can weigh between 2 and 4 pounds per crab on harvest, depending on stock conditions. To be conservative (and estimate a relatively large number of crab for a given weight) this discussion assumes an average weight of 2 pounds per crab. The *C. bairdi* Tanner crab by-catch rate in late March for an area of Zone 1 close to the treatment area varied considerably from year to year. The highest rate, 0.0019 kg of *C. bairdi* Tanner crab per kg of Pacific cod occurred in 1998 and 2000. The lowest rate,0.0002 occurred in 1999. This information suggests that if all the groundfish harvest forgone in the treatment area was made up in Zone 1 in late March, the number of additional crab that would be harvested in Zone 1 would range from 353 crabs to 3,351 crabs.

Alternatives 3 and 4 include the restrictions on trawling in their respective treatment areas,[10] found in Alternative 2, but add restrictions on fishing for groundfish with hook-and-line or pot gear in the treatment area. Alternative 3 clearly imposes higher costs on industry than Alternative 2, since it imposes restrictions on more gear types. Alternative 4 imposes fewer costs on industry than Alternative 3, since the definition of the treatment area under Alternative 4 excludes waters that are important to trawlers, but that add nothing to the experiment. Alternative 4 adds waters south of the Alternative 3 "arc" to the treatment area. This is not expected to impose costs on industry. An examination of harvest data and of observer data suggests that, in late March, most trawling ends north of this new area and that hook-and-line and pot gear are not active in the area.

5.9 Impacts on fishing communities

National Standard 8 of the MSA provides that, "Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities." (16 U.S.C. 1851) A fishing community is defined in the act as a community which is "substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community." (16 U.S.C. 1802)

As noted in Section 5.6, the groundfish harvested from the treatment area by catcher vessels in the second half of March have been delivered to Akutan, Unalaska, and King Cove during the past five years (1998-2002). Because the fish are delivered to only a few processors in each community, it has not been possible, owing to confidentiality considerations, to provide numerical estimates of the amounts of fish delivered to each community. These communities are all fisheries dependent communities, by any definition of that term. This is apparent from even a casual review of the Alaska Department of Community and Economic Development profiles of these communities. Akutan; "Commercial fish processing dominates Akutan's cash-based economy...." Unalaska: "Unalaska's economy is based on commercial fishing, fish processing, and fleet services..." King Cove: "King Cove's economy depends almost completely on the year-round commercial fishing and seafood processing industries..."

The information collected in this analysis suggests that the alternatives will not have a significant impact on these communities. The amounts of fish involved are modest compared to overall harvests of groundfish and other fish resources landed in these communities. The catcher vessels that harvested in the area to be restricted should be able to harvest almost as much P. cod as before by shifting their fishing areas by a few miles. Any shifts in fishing area are likely to move the fleet fishing operations further from the three ports and increase the costs of deliveries to these ports, but for small changes in fishing location these would remain the closest ports.

5.10 Impacts on minority and low-income populations

Because the impacts on the communities are expected to be quite small, the impacts of these alternatives on minority and low income populations within those communities are also expected to be indiscernible.

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[10]As noted earlier, Alternatives 3 and 4 define the treatment area somewhat differently.

5.11 Summary of the benefits and costs

The benefits and costs of the alternatives are summarized below in Table 5.11-1. These impacts were discussed more carefully in Sections 5.7 (Benefits), 5.8 (Costs). The final section of the RIR, Section 5.12, summarizes the implications for the E.O. 12866 significance analysis. These proposals are not believed to be significant within the meaning of E.O. 12866.

In general ,the information on operating behavior and costs that would make it possible to predict how fishermen and markets will react to the new regulation, and how their costs and revenues will change, is not available. Therefore, this analysis of benefits and costs must be primarily qualitative.

In addition to summarizing information on benefits and costs from Sections 5.7 and 5.8, Table 5.11-1 summarizes information from Sections 5.9 and 5.10 on community, low income and minority impacts, and summarizes the information on E.O. 12866 "significance" that can be gleaned from this RIR. The discussion of program objectives is not meant to be an analysis of the pros and cons of the program. It is a simple statement of whether or not the alternative appears to meet the objectives for this action outlined in Section 5.4. In particular, an alternative might meet those objectives and still not be desirable, for example, because of overall costs that outweigh the benefits, or because of important distributional consequences. The discussion of E.O. 12866 "significance" is not a certification of significance or non-significance. It is not the place of the analyst to weigh the various criteria and make that decision. It does, however, summarize the information bearing on the significance decision contained in this RIR.

Table 5.11-1 Summary of the cost and benefit analysis

	Alternative 1	Alternative 2	Alternative 3	Alternative 4 *(preferred)*
	No restrictions in the treatment area	No trawling in the treatment area	No trawling in the treatment area; no longlining or pot fishing in the treatment area either	No trawling, longlining or pot fishing in a treatment area that differs in shape from that in Alts 2 and 3
Benefits (see Section 5.7)	Baseline.	The experiment to test the localized depletion of Pacific cod by trawl gear will have more statistical power. Results have a greater likelihood of being useful for management decision making. The cost of experimental pot losses due to trawl-pot conflicts may be lower.	This alternative has benefits similar to those for Alt 2. In addition, this alternative may prevent an influx of pot and hook-and-line gear into the treatment area while the trawl gear is restricted. An influx of pot, and particularly of hook-and-line, gear may distort the harvest rates obtained from the experimental pots. Large removals during the period could result in decreases in local abundance that would be interpreted as a trawl effect.	This alternative has benefits equivalent to those for Alternative 3. In addition, by explicitly excluding "deeper" portions of the treatment area, important to trawlers but not to the experiment, Alternative 4 reduces the potential economic and operational burden on trawlers.
Costs: increased cost to industry (see Section 5.8)	Baseline.	Trawl vessels are expected to shift most of their fishing effort elsewhere. They may have increased costs due to the additional travel time required to fish somewhat further from Akutan, Dutch Harbor or King Cove. Revenue losses are expected to be minor. Potential for increased fixed gear activity may lead to misinterpretation of fixed gear harvests as a trawl effect. Potential for gear conflicts in early April if the restriction on trawl gear leads to increased fixed gear activity in the treatment area.	This alternative has costs similar to those for trawlers under Alt 2. The potential for cost and revenue impacts is increased due to the restriction on pot and hook-and-line gear.	This alternative has lower cost and revenue impacts for trawlers than Alternatives 2 and 3. The potential for cost and revenue impacts on hook-and-liners and pot operations is the same as under Alternative 3 and greater than Alternative 2.
Community impacts	Baseline	Community impacts are expected to be small	Community impacts are expected to be small.	Community impacts are expected to be small.
Impacts on minority and low income populations	Baseline	Any impacts are expected to be small	Any impacts are expected to be small	Any impacts are expected to be small
Does the alternative meet the action objectives (See Section 5.4)	No. This action does not increase the power of the test, or reduce the costs of the experiment.	Yes. This alternative increases the power of the test. The increase is not as great as under Alternatives 3 and 4 because of the potential for increased hook-and-line and pot activity.	Yes. This alternative increases the power of the test.	Yes. This alternative increases the power of the test.

Table 5.11-1 Summary of the cost and benefit analysis (Continued)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4 *(preferred)*
Is this action significant under E.O. 12866 (see Section 5.12)	This action does not appear to trigger the E.O. 12866 significance criteria.	This action does not appear to trigger the E.O. 12866 significance criteria	This action does not appear to trigger the E.O. 12866 significance criteria	This action does not appear to trigger the E.O. 12866 significance criteria
Notes: Alternative 1 (*status quo*) is the *no action* alternative and provides the *baseline* against which the costs and benefits for action alternatives have been estimated. The table is color-coded to separate benefit-cost analysis considerations from other issues.				

5.12 Summary of the significance criteria

A "significant regulatory action" under E.O. 12866 means any action that is likely to result in a rule that may:

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the executive order.

This discussion of E.O. 12866 significance is not a certification of significance or non-significance. It is not the place of the analyst to weigh the various criteria and make that decision. This discussion does, however, summarize the information bearing on the significance decision contained in this RIR.

The largest first wholesale gross revenues from the groundfish fishery in statistical area 655430 in the second half of March in any of the four years examined was $2.67 million in 1999. This almost certainly overstates the gross revenues from the impacted part of stat area 655430, compromising the treatment area. This proposal will not have an annual effect on the economy of $100 million or more. NMFS has not identified any factors that would: (a) "adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities," (b) "Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency"; (c) "Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof"; or (d) "Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the executive order."

5.13 Data Sources

The data used in RIR tables 5.6-1 to 5.6-3, and 5.6-5 to 5.6-11 were prepared by the Alaska Fisheries Information Network (AKFIN), a division of the Pacific States Marine Fisheries Commission (PSMFC).

For catcher vessels delivering on shore or to shoreside floating processors, harvest estimates are based on State of Alaska fish tickets. These data were selected with delivery dates between March 15 and April 2, or within two days of the proposed closure date to account for all deliveries. Alaska requires fishermen making groundfish landings to report the State statistical area of the landing on fish tickets. Errors in the assignment of catcher vessel harvest to a statistical area may be introduced at two levels: first, statistical area fished is a rough estimate of location of the catch made by fishermen at the time of delivery; and second, fishermen who operated in multiple statistical areas merely estimate the allocation of their harvests by statistical area.

Catcher-processor and mothership catcher vessel harvests were estimated from NMFS "blend" data. The blend is a mixture of data from observers and from Federal Weekly Processor Reports (WPRs) used for management. The blend estimate of harvest retains the broad Federal management areas of the harvest but not a vessel's latitude and longitude of catch as found in the observer data. To aggregate catch and value information from catcher-processor and catcher vessels (shoreside and mothership deliveries) by area for this analysis the management area from blend data was translated to State statistical area. This process required alignment of all total catch haul data from the observer program with the blend estimate of catch.

Observer program coverage provides information on the latitude and longitude at which gear was recovered, and thus provides a relatively reliable way of determining the location of harvest. However, only vessels over 125 feet in length are required to carry observers 100% of the time (except for vessels fishing pot gear, which are only required to carry observers 30% of the time). Even on vessels with 100% observer coverage, not all hauls can be observed. Most vessels operating in the proposed closure area are between 60 and 125 feet, and only require 30% observer coverage. In this group of vessels the harvest location of a large part of the harvest was estimated from other information.

In addition to location, data on catch composition is missing for catcher-processor harvests that are unobserved. Species catch composition was therefore also estimated from other information.

The details of the process used to estimate the species catch composition and the location of catch may be found in the administrative record. The approach used was a form of a "nearest neighbor" approach for lack of a better term. In essence, this approach estimates species composition and assigns a ½ by 1 degree latitude and longitude quadrant to harvest from an unobserved haul by comparison to observed haul data with similar attributes of week of harvest, location of harvest, and gear used. Vessels with unobserved hauls are assigned catch composition and harvest area from their own observed haul data using similar geographic area and time period when possible. If no observed haul information exists for a vessel then observed haul information from similar vessels (nearest neighbors) is used to make estimates about the vessel's harvest by species and area.

Vessels lacking specific catch location data recorded through observation are compared to vessels which are most similar first, but if no other vessels are similar with respect to all the criteria used, the criteria are dropped one by one, in successive iterations, until a category is found within which the vessel can be placed. In the first iteration, unobserved hauls are compared to a category made up of (a) the vessel

itself, (b) the same weekly fishing period, (c) the same Federal statistical reporting area, and (d) the same gear type. In the second iteration, the criterion that the unobserved hauls must be from the same vessel as the observed vessel is dropped, and the vessel is compared to other vessels from the same period, reporting area, and gear type. In subsequent iterations other restrictions are dropped, the criteria are made more and more general, and the "neighborhood" becomes larger and larger.

Catcher vessel gross revenues are estimated using price estimates prepared by the Alaska Commercial Fisheries Entry Commission in an ongoing process unrelated to this analysis. These annual price estimates are based on data collected from the Alaska Commercial Operator's Annual Reports (COAR) and from fish ticket information.

Catcher-processor, mothership, and inshore processor prices are first wholesale prices that were prepared at the Alaska Fisheries Science Center for this analysis. The first wholesale prices are estimated by dividing total first wholesale gross revenues for a species by the delivered round weight of that species. These wholesale prices are broken out by gear type for catcher-processors, but the available data do not make it possible to break them out by gear type for catcher-vessels. Prices for pollock and Pacific cod are calculated for the first half of the year, reflecting the roe content of the fish at that time. March prices for other groundfish species are annual prices. Annual prices were used because the lower volume of products for these other species made it difficult to calculate seasonal prices. First wholesale prices could not be estimated for some species and gear types. This only affected catcher-processors, and did not affect Pacific cod landings. Thus this affects a relatively small part of the fish production from Area 655430.

6.0 INITIAL REGULATORY FLEXIBILITY ANALYSIS

6.1 Introduction

This Initial Regulatory Flexibility Analysis (IRFA) examines the adverse impacts on small entities of a preferred alternative that will close waters north of Unimak Pass to fishing for groundfish during the last two weeks of March in 2003, 2004, 2005, and 2006. These waters are adjacent to an area already closed to trawling for Pacific cod and pollock due to the proximity of a Steller sea lion haulout at Cape Sarichef on the western end of Unimak Island in the Aleutians.

This closure is meant to increase the scientific value of an experiment to test the hypothesis that Pacific cod trawling causes localized depletion of Pacific cod stocks. The results of this experiment may have important implications for regulations that currently restrict fishing activity in order to protect Steller sea lion stocks.

6.2 The purpose of an IRFA

The Regulatory Flexibility Act (RFA), first enacted in 1980, was designed to place the burden on the government to review all regulations to ensure that, while accomplishing their intended purposes, they do not unduly inhibit the ability of small entities to compete. The RFA recognizes that the size of a business, unit of government, or nonprofit organization frequently has a bearing on its ability to comply with a Federal regulation. Major goals of the RFA are: (1) to increase agency awareness and understanding of the impact of their regulations on small business, (2) to require that agencies communicate and explain their findings to the public, and (3) to encourage agencies to use flexibility and to provide regulatory relief to small entities. The RFA emphasizes predicting impacts on small entities as a group distinct from other entities and on the consideration of alternatives that may minimize the impacts while still achieving the stated objective of the action.

On March 29, 1996, President Clinton signed the Small Business Regulatory Enforcement Fairness Act. Among other things, the new law amended the RFA to allow judicial review of an agency's compliance with the RFA. The 1996 amendments also updated the requirements for a final regulatory flexibility analysis, including a description of the steps an agency must take to minimize the significant economic impact on small entities. Finally, the 1996 amendments expanded the authority of the Chief Counsel for Advocacy of the Small Business Administration (SBA) to file *amicus* briefs in court proceedings involving an agency's violation of the RFA.

In determining the scope, or 'universe', of the entities to be considered in an IRFA, NMFS generally includes only those entities that can reasonably be expected to be directly regulated by the proposed action. If the effects of the rule fall primarily on a distinct segment, or portion thereof, of the industry (e.g., user group, gear type, geographic area), that segment would be considered the universe for the purpose of this analysis. NMFS interprets the intent of the RFA to address negative economic impacts, not beneficial impacts, and thus such a focus exists in analyses that are designed to address RFA compliance.

Data on cost structure, affiliation, and operational procedures and strategies in the fishing sectors subject to the proposed regulatory action are insufficient, at present, to permit preparation of a "factual basis" upon which to certify that the preferred alternative does not have the potential to result in "significant adverse impacts on a substantial number of small entities" (as those terms are defined under RFA). Because, based on all available information, it is not possible to 'certify' this outcome, should the proposed action be adopted, a formal IRFA has been prepared and is included in this package for Secretarial review.

6.3 What is required in an IRFA?

Under 5 U.S.C., Section 603(b) of the RFA, each IRFA is required to contain:

- A description of the reasons why action by the agency is being considered;
- A succinct statement of the objectives of, and the legal basis for, the proposed rule;
- A description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply (including a profile of the industry divided into industry segments, if appropriate);
- A description of the projected reporting, record keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;
- An identification, to the extent practicable, of all relevant Federal rules that may duplicate, overlap or conflict with the proposed rule;
- A description of any significant alternatives to the proposed rule that accomplish the stated objectives of the proposed action, consistent with applicable statutes, and that would minimize any significant adverse economic impact of the proposed rule on small entities. Consistent with the stated objectives of applicable statutes, the analysis shall discuss significant alternatives, such as:

    1. The establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities;

    2. The clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities;

    3. The use of performance rather than design standards;

    4. An exemption from coverage of the rule, or any part thereof, for such small entities.

6.4 What is a small entity?

The RFA recognizes and defines three kinds of small entities: (1) small businesses, (2) small non-profit organizations, and (3) and small government jurisdictions.

Small businesses. Section 601(3) of the RFA defines a 'small business' as having the same meaning as 'small business concern' which is defined under Section 3 of the Small Business Act. 'Small business' or 'small business concern' includes any firm that is independently owned and operated and not dominant in its field of operation. The SBA has further defined a "small business concern" as one

"organized for profit, with a place of business located in the United States, and which operates primarily within the United States or which makes a significant contribution to the U.S. economy through payment of taxes or use of American products, materials or labor...A small business concern may be in the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative, except that where the firm is a joint venture there can be no more than 49 percent participation by foreign business entities in the joint venture."

The SBA has established size criteria for all major industry sectors in the U.S., including fish harvesting and fish processing businesses. A business involved in fish harvesting is a small business if it is independently owned and operated and not dominant in its field of operation (including its affiliates) and if it has combined annual receipts not in excess of $3.5 million for all its affiliated operations worldwide. A seafood processor is a small business if it is independently owned and operated, not dominant in its field of operation, and employs 500 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide. A business involved in both the harvesting and processing of seafood products is a small business if it meets the $3.5 million criterion for fish harvesting operations. Finally a wholesale business servicing the fishing industry is a small business if it employs 100 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide.

The SBA has established "principles of affiliation" to determine whether a business concern is "independently owned and operated." In general, business concerns are affiliates of each other when one concern controls or has the power to control the other, or a third party controls or has the power to control both. The SBA considers factors such as ownership, management, previous relationships with or ties to another concern, and contractual relationships, in determining whether affiliation exists. Individuals or firms that have identical or substantially identical business or economic interests, such as family members, persons with common investments, or firms that are economically dependent through contractual or other relationships, are treated as one party with such interests aggregated when measuring the size of the concern in question. The SBA counts the receipts or employees of the concern whose size is at issue and those of all its domestic and foreign affiliates, regardless of whether the affiliates are organized for profit, in determining the concern's size. However, business concerns owned and controlled by Indian Tribes, Alaska Regional or Village Corporations organized pursuant to the Alaska Native Claims Settlement Act (43 U.S.C. 1601), Native Hawaiian Organizations, or Community Development Corporations authorized by 42 U.S.C. 9805 are not considered affiliates of such entities, or with other concerns owned by these entities solely because of their common ownership.

Affiliation may be based on stock ownership when (1) A person is an affiliate of a concern if the person owns or controls, or has the power to control 50 percent or more of its voting stock, or a block of stock which affords control because it is large compared to other outstanding blocks of stock, or (2) If two or more persons each owns, controls or has the power to control less than 50 percent of the voting stock of a concern, with minority holdings that are equal or approximately equal in size, but the aggregate of these minority holdings is large as compared with any other stock holding, each such person is presumed to be an affiliate of the concern.

Affiliation may be based on common management or joint venture arrangements. Affiliation arises where one or more officers, directors or general partners controls the board of directors and/or the management of another concern. Parties to a joint venture also may be affiliates. A contractor or subcontractor is treated as a participant in a joint venture if the ostensible subcontractor will perform primary and vital requirements of a contract or if the prime contractor is unusually reliant upon the

ostensible subcontractor. All requirements of the contract are considered in reviewing such relationship, including contract management, technical responsibilities, and the percentage of subcontracted work.

Small organizations. The RFA defines "small organizations" as any not-for-profit enterprise that is independently owned and operated and is not dominant in its field.

Small governmental jurisdictions. The RFA defines small governmental jurisdictions as governments of cities, counties, towns, townships, villages, school districts, or special districts with populations of less than 50,000.

6.5 What is this action?

The Council's preferred action is Alternative 4. This is described in detail in Sections 1.2 of the EA and 5.5 of the RIR. Under this alternative, no trawling, longlining, or pot fishing would be allowed within the area designated as Alternative 4 in Figure 1.1-2 from March 15 to March 31 in 2003-2004. This area is described as the "treatment area." The Alternative 4 treatment area differs from that in Alternatives 2 and 3, in that certain waters used by trawlers, but not needed for the experiment, are excluded from the treatment area, and certain waters just outside the southern end of the treatment area under Alternatives 2 and 3 are included under Alternative 4.

6.6 Reason for considering the proposed action

The reasons for considering this action are described in detail in Sections 1.1 and 5.4 of this EA/RIR/IRFA. The western distinct population segment (DPS) of the Steller sea lions has declined precipitously over the last 20 years. Consequently, the western DPS has been listed as endangered under the Endangered Species Act.

Many believe that one cause of the decline may be localized depletion of Steller sea lion groundfish prey by commercial fishing operations. To limit the potential for this localized depletion, fishing regulations that became effective in 2002 incorporate restrictions on fishing near Steller sea lion critical habitat. These restrictions impose costs on industry. Nonetheless, many feel that the restrictions already imposed are not strict enough.

While the localized depletion hypothesis is logically possible, there is little actual empirical evidence to support or refute it, or to relate actual levels of localized depletion to impacts on Steller sea lion populations. NMFS's Alaska Fisheries Science Center (AFSC) has obtained funding to do an experiment with pot gear to test the localized depletion hypothesis in waters off of Cape Sarichef. However, ongoing trawling operations in some of these waters may destroy pots, interfering with the experiment, and reducing the ability of the experiment to discriminate between hypotheses (reducing the "power" of the statistical tests). This would reduce the value of the experimental results for helping design a regulatory system that protects sea lions and avoids an undue burden on industry. The proposed action would reduce these conflicts and increase the power of the experiment's statistical tests.

6.7 Objectives of, and legal basis for, the proposed action

The objective of the proposed action is to reduce the loss of pots in this experiment, and to increase the statistical power and usefulness of the experimental results as a test of the localized depletion hypothesis.

The National Marine Fisheries Service manages the U.S. groundfish fisheries of the Bering Sea and Aleutian Islands management area in the Exclusive Economic Zone under the Fishery Management Plan (FMP) for that area. The North Pacific Fishery Management Council prepared the FMP under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Regulations implement the FMPs at §50 CFR part 679. General regulations that also pertain to U.S. fisheries appear at subpart H of §50 CFR part 600.

6.8 Number and description of small entities affected by the proposed action

What are the regulated entities?

The entities that will be regulated by this action are the catcher vessels and catcher-processors that would have fished in the treatment area in the second half of March, and that will not be able to do so from 2003 to 2006. These include vessels using trawl, hook-and-line and pot gear.

Number of small regulated entities

As noted, the SBA small entity threshold is $3.5 million dollars in gross revenues from all operations. The revenue estimate should include the revenues from all affiliated operations. For example, if a fishing vessel was owned by a company with two or more vessels, the revenues from all of these vessels should be included in the revenue estimate.

Table 6.8-1 contains estimates of the numbers of small and large entities active in Alaskan statistical area 655430 in the second half of March for each year from 1998 to 2001 (2002 estimates are not available). The right hand columns show the estimated average gross revenues for the large and small entities in each year. The numbers of small entities ranged from 51 in 1998 to 23 in 2001.

Table 6.8-1 Large and small entities groundfish fishing in Alaska statistical area 655430 in the second half of March

Year	Small	Large	Total	Average annual gross revenues for small (millions of dollars)	Average annual gross revenues for large (millions of dollars)
1998	56	9	67	$1.14	$7.84
1999	53	11	64	$1.63	$4.58
2000	21	15	36	$1.02	$5.10
2001	32	7	39	$1.29	$5.19

Notes: Gross revenue estimates are based on ex-vessel groundfish prices for catcher vessels and wholesale prices for catcher-processors. The estimates for both classes of vessels also include ex-vessel gross revenues for crab, herring, salmon, and halibut.
Source: PSMFC, AKFIN 8-30-02. (See Section 5.13 of the RIR for a detailed description of the data sources.)

Description of small regulated entities

As noted above, there were between 21 and 56 small entities active in the area per year from 1998-2001. As noted in Table 6.8-1, the average annual gross revenues for the small operations ranged between about $1.02 million and $1.63 million in these years. These vessels obtained most of their revenues from groundfish, a relatively small amount from crab, and even less from herring, salmon or halibut. The average gross revenues for these small entities in all of Area 655430 (an area substantially larger than the treatment area) during the last two weeks in March, were abut $10,000 in 1998, $18,000 in 1999, $19,000 in 2000, and $17,000 in 2001. (PSMFC, AKFIN 8-30-02).

As noted in Section 5.6, medium sized (60-125 foot) bottom trawlers targeting Pacific cod and delivering them to shoreside processors were the most important element in the fleet fishing for groundfish in Alaska statistical area 655430 during the second half of March from 1998 to 2001. The relative size of this fleet's catch decreased, however, during this period. Vessels of this description harvested 78% of the groundfish from the statistical area in 1998, but their share declined to 31% in 2001. As shown in Table 2.3-1, this decline is paralleled by an overall decline in harvests from this area over the period. It was, in fact, the decline in the harvests by this class of vessel that accounted for most of the decline in overall harvest from the area. (NMFS Alaska Region Catch by Vessel data set)

The absolute size of this fleet also declined during this period. The smaller numbers of vessels in 2000 and 2001, and potential confidentiality issues, make it difficult to characterize these changes in the fleet. However, as harvests by the vessels described above declined, harvests by vessels with other characteristics became relatively more important. Catcher-processors became more important in 2000 and 2001. Pot gear, in particular became important in 2001, also accounting for a third of the harvest. Harvests from vessels targeting Pacific cod declined somewhat, but remained high. (NMFS Alaska Region Catch by Vessel data set).

6.9 Impacts on regulated small entities

Impact on cash flow or profitability

The preferred alternative will prevent trawling, longlining, and pot fishing in the treatment area for two weeks in the second half of March in 2003, 2004, 2005, and 2006. For the dimensions and location of the closed area under Alternative 4, refer to Table 1.1-2. The expectation is that fishing vessels that would otherwise have fished in the treatment area during that period will alter their fishing patterns so as to fish elsewhere. Many may fish in waters to the northeast of the treatment area, or to the north of it on the north side of a highly productive fishing area commonly known as the "horseshoe." These alternative waters are further from the delivery ports and support services available at Akutan, Unalaska, and King Cove.

If left unrestricted, fishermen will operate to their best advantage. The closure proposed in the treatment area may force them to operate in a less optimal manner, either increasing their costs due to increased travel time, lower catch per unit of effort, or some other factor, or decreasing their revenues if they are unable to catch elsewhere what they would have caught in the treatment area. This would be associated with some increased costs. Thus, any operation which, absent the proposed action, would have chosen to fish in the restricted area during this two week period, but for the closure, is likely to experience an adverse impact.

The adverse impacts of the proposed action on these operations will be small. The average gross revenues from the entire statistical area, within which the treatment area resides, are obviously small compared to overall small entity average gross revenues over the course of the year. They are also relatively small compared to their total revenues from fishing activity in the last two weeks of March. In 1998, these small entities made about 26% of their revenues from the second half of March in all of State statistical area 655430, in 1999 they made about 32%, in 2000 they made about 20%, and in 2001 they made about 16%. (PSMFC, AKFIN 8-30-02) It appears likely that these vessels will be able to alter their operations to continue their fishing activity elsewhere in the second half of March, therefore actual revenue loss should be much less than the average revenue from the statistical area. Thus the average gross revenues overstate the total adverse impact of the rule on the small entities.

6.10 Recordkeeping and reporting requirements

The IRFA should include "a description of the projected reporting, record keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirement and the type of professional skills necessary for preparation of the report or record..."

This regulation does not impose new recordkeeping or reporting requirements on the regulated small entities.

6.11 Federal rules that may duplicate, overlap, or conflict with proposed action

An IRFA should include "An identification, to the extent practicable, of all relevant Federal rules that may duplicate, overlap or conflict with the proposed rule..."

This analysis did not reveal any Federal rules that duplicate, overlap or conflict with the proposed action.

6.12 Description of significant alternatives

An IRFA should include "A description of any significant alternatives to the proposed rule that accomplish the stated objectives of the Magnuson-Stevens Act and any other applicable statutes and that would minimize any significant economic impact of the proposed rule on small entities." The preferred alternative for this action is Alternative 4. The three other alternatives considered in this RIR/IRFA are summarized in Table 6.12-1.

Table 6.12-1 Alternatives subjected to detailed study

Alternative	Description	Impact on directly regulated small entities	Why not chosen if better for directly regulated small entities?
Alt 1	Status quo: no closure of treatment area	No impact on regulated small entities.	Does not accomplish the objectives of this action.
Alt 2	Treatment area defined as arc around northwest of Cape Sarichef restricted trawl zone. Treatment area closed to all trawling	Small trawl entities may not fish in the treatment area from March 15 to March 31. They are likely to be able to make up lost revenues by fishing elsewhere during this period, but only at increased cost. If they continue to fish in areas near the treatment area, they will be operating further from port facilities at Akutan, Unalaska, and King Cove. There would be no adverse impacts on hook-and-line or pot fishermen.	The "arc" shaped treatment area restricts trawling activity more than is necessary to increase the power of the experimental results. Closing the area to trawling, but allowing an influx of hook-and-line and pot gear may produce a mis-interpretation of experimental results, and may lead to gear conflicts when the treatment area is reopened to trawling in early April.
Alt 3	Treatment area defined as arc around northwest of Cape Sarichef restricted trawl zone. Treatment area closed to trawling, longlining, and pot fishing for groundfish	Small trawl entities, hook-and-liners and pot fishermen may not fish in the treatment area from March 15 to March 31. The impacts on trawl operations would be the same under Alts 2 and 3. Small numbers of hook-and-liners and pot fishing operations would potentially also face the same adverse impacts. This "loss" is only potential because these operations do not currently make substantial use of this area, at this time of the year, under the status quo.	The "arc" shaped treatment area restricts trawling activity more than is necessary to increase the power of the experimental results.
Notes: A more detailed discussion of the impacts on small entities may be found in Section 6.9 of this EA/RIR/IRFA.			

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APPENDIX A

STUDY TO ASSESS THE EFFECT OF COMMERCIAL TRAWLING ON LOCAL ABUNDANCE OF PACIFIC COD (*Gadus Macrocephalus*)

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Latest Revision: September 9, 2002

A1. Overview of the Study

Management strategies for fisheries in the Bering Sea and in the Gulf of Alaska have been severely altered in recent years in response to the listing of the Steller sea lion as endangered under the Endangered Species Act. The Fisheries Interaction Team (FIT) of the AFSC has been charged with investigating the effectiveness of these changes in fishery management. Currently the information available to evaluate alternative methods for protecting Steller sea lions and their habitat is very limited. The FIT has proposed a field experiment to improve the information available to assess further management actions to protect Steller sea lions. This study is an integral part of a NMFS comprehensive research program designed to evaluate effects of fishing on the foraging behavior of Steller sea lions.

The goal of the experiment is to evaluate the effects of commercial trawl fishing on the local abundance of Pacific cod (*Gadus macrocephalus*), which aggregate over spawning grounds in the Aleutian Islands and southeastern Bering Sea during winter months. Cod have been found to be a frequent prey item in winter scat samples from Steller sea lions in the eastern Aleutians (Sinclair and Zeppelin 2002). The same dense aggregations of cod which attract commercial fishing may provide an important seasonal food resource for sea lions. Localized depletion of Pacific cod has been implicated as a possible mechanism for adverse effects of the commercial fishery on availability of prey for Steller sea lions. This experiment is designed to look at effects of the intensive winter trawl fishery on local abundance of Pacific cod in the vicinity of Unimak Pass in the eastern Bering Sea (Figure A1-1). A successful experiment will provide data for a quantitative statistical test of the presence or absence of a localized depletion effect from this fishery, which will help to define appropriate management action. The localized depletion study also provides a platform for sample collection and observation of spawning cod that is not available from regular summer surveys. A cod tagging program focused on winter spawning aggregations is also being conducted to collect information on both small-scale movements and long-range seasonal migrations. Data from tagging studies will be useful to help formulate a model of cod behavior and distribution. Such a model may be able to provide specific hypotheses and predictions of effects of various management alternatives.

The study will use standardized pot-fishing gear to collect an index of local cod abundance. Pot gear is well-proven for Pacific cod, and can be fished at fine spatial resolution. Most importantly, pot catch data has statistical properties that make it much more amenable to statistical testing than trawl samples. The large number of pots that can be worked within a sea day allows a larger sample size than would be feasible with a trawl study, which increases statistical precision. Feasibility studies have also shown that pot catches of cod have a much lower variance than trawl data, which also increases the power of a statistical test.

The research proposal recognizes that many uncontrolled factors play a role in determining local cod abundance, including habitat variation, seasonal and short-term fish movement, and effects of climate, circulation, and weather events. The study is designed as a comparison between sites within the area subject to intensive seasonal trawling (the "treatment") and "control" sites within a nearby zone where trawling is prohibited. Each site is to be surveyed before and immediately after the main trawling season. While there are many factors that may contribute to a change in local abundance between the two surveys, these factors are expected to have similar effects on trawled and control areas. Thus, the

experiment is designed to look at the rate of change in local abundance between the "before" and "after" surveys, and test whether this rate of change is the same in trawled and untrawled areas.

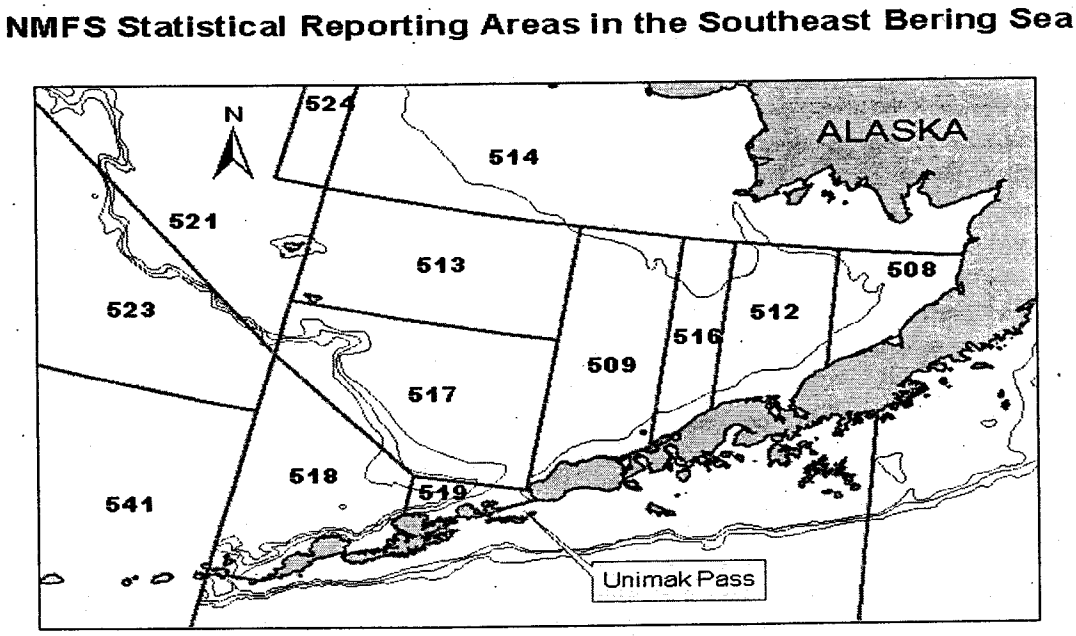


Figure A1-1. General location of Unimak Pass study area, and NMFS statistical reporting areas in the southeast Bering Sea.

Current regulations prohibit directed trawling for walleye pollock or Pacific cod within 10 nautical miles (nm) of specified Steller sea lion rookery and haulout sites, including haulouts at Billings Head on Akun Island and at Cape Sarichef on Unimak Island. These trawl exclusion zones bracket the northeastern and northwestern sides, respectively, of Unimak Pass. The Cape Sarichef zone, in particular, intersects the area that has historically been the main site of the winter cod trawl fishery. The study areas selected for the local abundance experiment include the outer portion of the Cape Sarichef no-trawl zone and the open trawling grounds just outside this boundary.

Gear trials and preliminary feasibility studies with research pot fishing were conducted off Kodiak Island in June 2001 and in Unimak Pass in March-April 2002. Final gear trials are scheduled for September-October 2002 and the full experiment for winter 2003. Repetition of the experiment in future years is anticipated, contingent on funding and the results obtained in 2003.

A regulatory amendment is being requested in fall 2002 to create a short-term closure in the vicinity of the cod pot study. This closure is being requested due to the incompatible nature of trawling and fixed-gear fisheries. In order to conduct the "after" survey in the trawled zone, NMFS will need to set and haul experimental pots at the trawled sites without having research gear picked up or disturbed by trawls. NMFS's concern is not only the expense of lost gear, but the potential damage to the experimental design due to lost survey data. The proposed regulatory amendment would prohibit trawl fishing in the experimental area only during the "after" portion of the experiment, which will be scheduled for March 15 and 31 of each year (2003 through 2006). The requested prohibition affects only a portion of the traditional cod trawling ground, and is limited to the two-week period needed for the experiment. A full EA/RIR/IRFA for the proposed closure has been prepared.

A2. Preliminary Studies and Need for Experiment

Section 7(a) of the Endangered Species Act requires that any Federal Agency action ....." is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat." As the action agency for management of groundfish fisheries in the BSAI and GOA, NMFS has responsibility for ensuring that fishery regulations in these regions comply with the ESA. This study is part of an NMFS research effort to examine possible effects of the Pacific cod fishery on this species.

Sea lion diet analysis (Sinclair and Zeppelin 2002) shows that Pacific cod are a frequent component of sea lion diets during the winter months. A preliminary discussion paper on the potential for interactions between the BSAI and GOA cod fisheries and Steller sea lions was prepared by the Protected Resources Division of NMFS and discussed at the June 2000 Council meeting. This paper concluded that spatial and temporal overlap exists between commercial cod fisheries and use of cod by Steller sea lions during the winter months, and that a substantial fraction of the pre-2000 commercial catch was taken within SSL critical habitat. The spatial and temporal intensity of the cod fishery, especially the trawl fishery, was noted and a possibility of localized depletion of pacific cod in critical habitat was raised. The August 2000 injunction closing SSL critical habitat to trawl fishing included trawling for Pacific cod. The

APPENDIX A: COD POT LOCAL ABUNDANCE STUDY Rev:10/9/02

November 2000 Biological Opinion (NMFS 2000, page 233 & 260) identified three major groundfish fisheries as having the greatest potential for effecting the endangered western stock of Steller se lions: walleye pollock, Atka mackerel, and Pacific cod. The Biological opinion cited temporal concentration of fishing effort for walleye pollock, Pacific cod, and Atka mackerel as resulting in high local harvest rates, which may reduce the quality of the habitat for Steller sea lions on a seasonal time scale. This possibility of "localized depletion" effects from the trawl fishery was the basis for recommendations regarding seasonal and regional apportionment of TAC for these three species, and seasonal no-trawl zones around SSL rookeries and haulouts.

A statistical evaluation of NMFS observer data examined CPUE of commercial cod trawls within the Sea Lion Conservation Area of the southeast Bering Sea (M. Smith, NMFS unpublished internal document, August 2000). This analysis concluded that CPUE showed statistically significant declines over time in this region, consistent with localized depletion of Pacific cod. The analysis was, however, unable to distinguish between localized depletion and seasonal dispersion of cod from high-density spawning assemblages to a lower-density spatial pattern. Previous tagging studies with Pacific cod (Shimada and Kimura 1994) indicate that these fish undergo a substantial seasonal migration, aggregating near the edge of the southeast Bering Sea shelf in winter to spawn. Little is presently known about the spawning locations and behavior of Pacific cod, including the timing of seasonal migration, spawning aggregation, and dispersal. A workshop on Pacific cod spawning processes was held in Anchorage in March 2002; one of the principal conclusions of this workshop was that a much better understanding is needed of cod spawning habitat, spawning behavior, size and age at maturity, and fecundity.

Congressional appropriation of funding for Steller sea lion research specifically mentions testing of the localized depletion hypothesis as a research goal, and the AFSC Draft Framework for FY2001 Stellar Sea Lion Research specifically requested : "Construct studies associated with commercial fishing that characterize the prey field before, during, and after fishing". The Fisheries Interaction Team at the Alaska Fisheries Science Center (AFSC) proposed a field experiment to examine effects of the winter Pacific cod trawl fishery on local abundance of cod. This experiment was designed both as a general test of the localized depletion hypothesis and as a specific study of possible localized depletion of Pacific cod within SSL critical habitat. The study is designed as a comparison between sites subject to intensive seasonal trawling and nearby "control" sites where trawling is prohibited. The experiment is designed to look at the rate of change in local abundance between the "before" and "after" surveys, and test whether this rate of change is the same in trawled and untrawled areas. The study will use pot catch of Pacific cod as an index of local abundance. Coupled with the localized depletion experiment are a tagging study and sample collection to gather better information on cod spawning habitat, behaviors, seasonal movement rates, and maturity/fecundity.

This study has been funded through 2003 as an integral part of a NMFS comprehensive research program designed to evaluate effects of fishing on the foraging behavior of Steller sea lions. A study result that clearly demonstrates localized changes in fish abundance due to commercial harvest will support the current limitations on commercial catch of cod in SSL critical habitat areas. A negative result would suggest that fishing at currently permitted levels does not cause substantial localized depletion. This project will also provide initial feasibility work for scientific studies using pot gear, which could be used to address questions of spatial variation for cod and other demersal species. NMFS has conducted initial feasibility trials to develop design of the experiment and is ready to conduct the full localized depletion experiment in winter 2002-2003. NMFS cod studies in the Unimak Pass area are being coordinated with

physical oceanographic studies by the Pacific Marine Environmental Laboratory, other NMFS fisheries interaction studies, and projects of the National Marine Mammal Laboratory.

A3. Objectives of the Study

The study objectives fit broadly into three categories:

1) Test of the localized depletion hypothesis. One of the mechanisms suggested by which commercial fishing may adversely affect Steller sea lions is by localized depletion of sea lion prey. The overall harvest level for groundfish in the BSAI is regulated at a sustainable level by the FMP. What is not known is whether intensive fishing within a small area can create a localized depletion of groundfish at spatial and temporal scales relevant to Stellar sea lions. The winter trawl fishery for Pacific cod in the southeastern Bering Sea is strongly localized over both space and time; a large percentage of the catch is taken in the area immediately north of Unimak Pass in February and March of each year. Localized depletion by this fishery has been suggested by preliminary analysis of commercial CPUE data. The experiment is designed to look for effects of the intensive winter trawl fishery near Unimak Pass on local abundance of Pacific cod. A successful experiment will provide data for a quantitative statistical test of the presence or absence of a localized depletion effect.

2) Biological information on cod spawning habitat, spawning behaviors, and seasonal movement. A recent meeting of cod researchers identified several areas of basic biological information about cod reproduction that are still unknown. The localized depletion study provides a platform for sample collection and observation of spawning cod that is not available from regular summer surveys. Investigations already initiated in conjunction with the study include collection of length frequencies, sex ratios, and maturity data from cod on spawning grounds; sample collection for proximate analysis and fecundity studies of cod at different ages and spawning stages. A winter tagging program has been set up to collect information on both small-scale movements of cod during spawning season and long-range seasonal migrations. These studies may also help to distinguish seasonal patterns of aggregation and dispersion among Pacific cod, which will help in the interpretation of local abundance and CPUE data. Another goal of the tagging study is to parameterize cod movements in models of Steller sea lion foraging. Expanded knowledge of seasonal movement, spawning habitat, and behaviors may also improve future stock assessment modeling and management of BSAI Pacific cod.

3) Development of Experimental Pot-Fishing Gear. Current stock assessments rely primarily on data from trawl surveys, which allow an estimate of total biomass over a region or management unit. However, the high variability and small sample sizes associated with trawl gear limits its use for comparative studies where statistical comparisons are desired. This experiment provides feasibility testing and development for experimental use of pot gear, which may be useful in future studies where comparison of abundance indices under different conditions or over small spatial and temporal scales is the primary goal. Development of trigger timers and pot-mounted water-quality sensors for this experiment may also be useful for studies of diel and tidal movement and foraging of groundfish.

A4. Selection of the Study Area

The area selected for the localized depletion study is along the outer Bering sea shelf on the north side of Unimak Pass and Unimak Island (Figure A1-1). This area is known to be an area of high biological productivity, probably because of unique physical/chemical features (National Research Council 1996). Some northward transport of North Pacific water through the pass occurs as the Alaskan coastal current passes along the south side of the Alaska peninsula. Upwelling of deep Bering Sea waters is also believed to occur as the eastward-flowing Aleutian current encounters the "horseshoe" at edge of Bering Sea shelf. The physical and chemical structure of waters in the study area is also subject to annual climate variation and strongly effected by ice dynamics and weather-driven thermal structuring of the southeastern Bering sea (Stabeno et al 2002).

Examination of commercial catch data for 1993-2002 showed that the area north and northeast of Unimak Pass was consistently a source of high catches of Pacific cod (Figure A4-1). Prior to creation of no-trawl zones in 1999, over 50% of the winter catch of Pacific cod came from within Steller sea lion critical habitat (NMFS 2000). Even after the implementation of sea lion protection measures, as much as 15% of the annual cod catch comes from federal area 517 during the winter quarter (Jan-March). The Unimak Pass area was selected for the study because the trawl fishery here has historically been highly focused both in space and time, conditions which are believed most likely to result in localized depletion of target fish. The area that has historically been heavily fished is a plateau at 70-90 meters depth (40-50 fathoms) directly north of the pass and north of Cape Sarichef on the eastern tip of Unimak Island. A popular trawl alley includes this plateau and generally runs along the 100 meter depth contour north and east from the pass.

Since 1999, 3 nm no-transit zones and 10-20 nm no-trawl zones have been established around known locations of Steller sea lion rookeries or haulouts in the GOA and BSAI (NMFS 2001b). From 1999 through 2001, these zones included a 20 nm no-trawl boundary around the Billings Head rookery on Akun Island and a rookery on Ugamak Island, on the south side of Unimak Pass. The eastern and northern edges of these zones reach the edge of the plateau region north of the pass, and for 2000—2001 these boundaries defined the fished zone. For 2002, a sea lion haulout at Cape Sarichef on Unimak Island (54.5717N, 164.9467W) was added to the list of protected sites, and the no-trawl zones at Billings Head was reduced to 10 nm. Figure A4-2 compares the placement of the regulatory boundaries both before and after this change, and shows haul locations for observed bottom trawls in 2001 and 2002, respectively. The figure clearly illustrates the intense use of the area just outside the no-trawl boundary. In designing the study, we make use of this regulatory boundary to provide "treatment" and "control" areas that have similar habitat and physical conditions but very different levels of fishery exploitation. This location provides the greatest feasibility for a field experiment regarding the effects of commercial trawling on local distributions of groundfish.

Figure A4-1. Map of historical cod trawl catch data from 1999 (aggregated over 5Km square blocks). Areas of highest catches are shown in dark green in the BSAI and red in the GOA. (R. Reuter, AFSC)

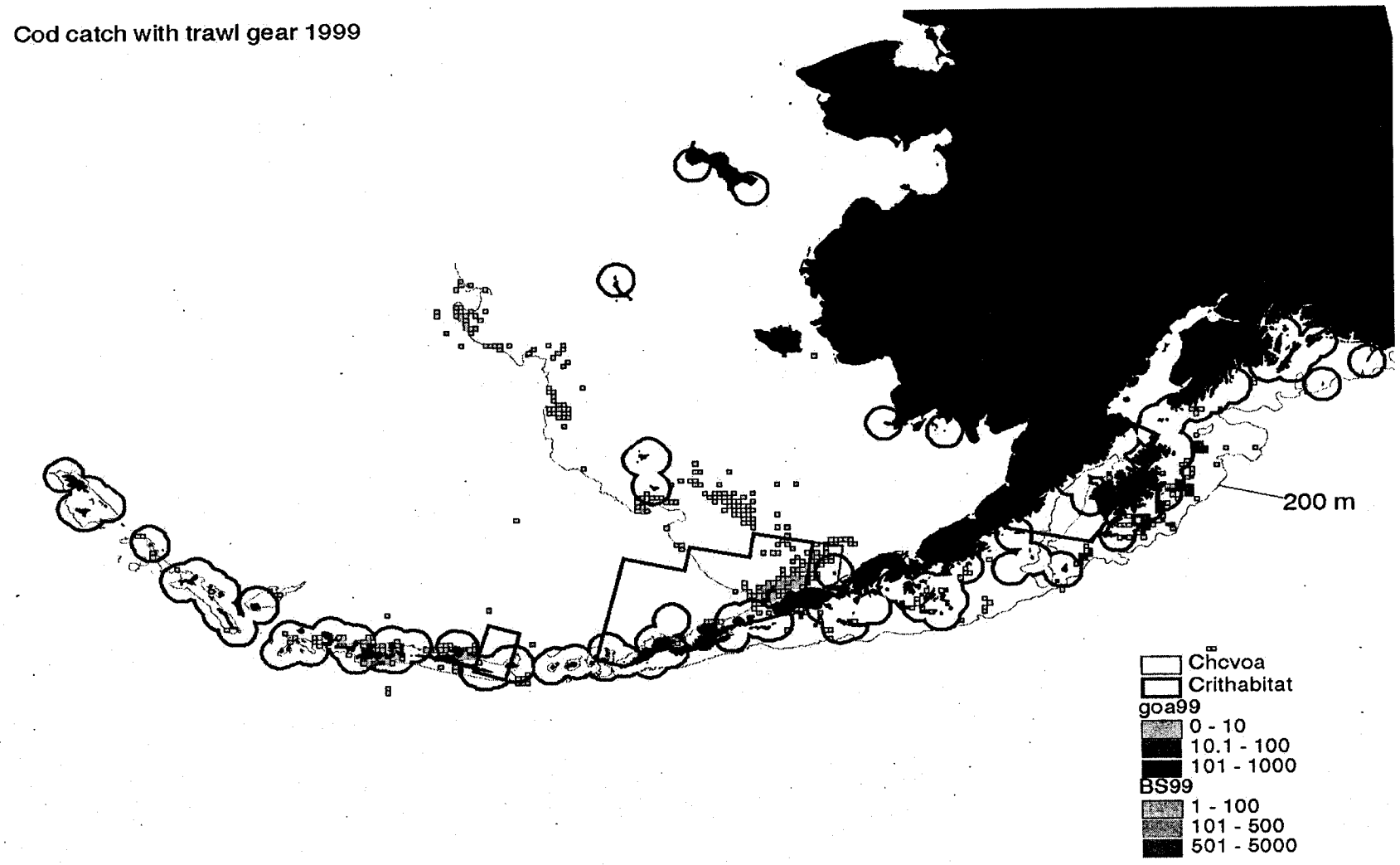
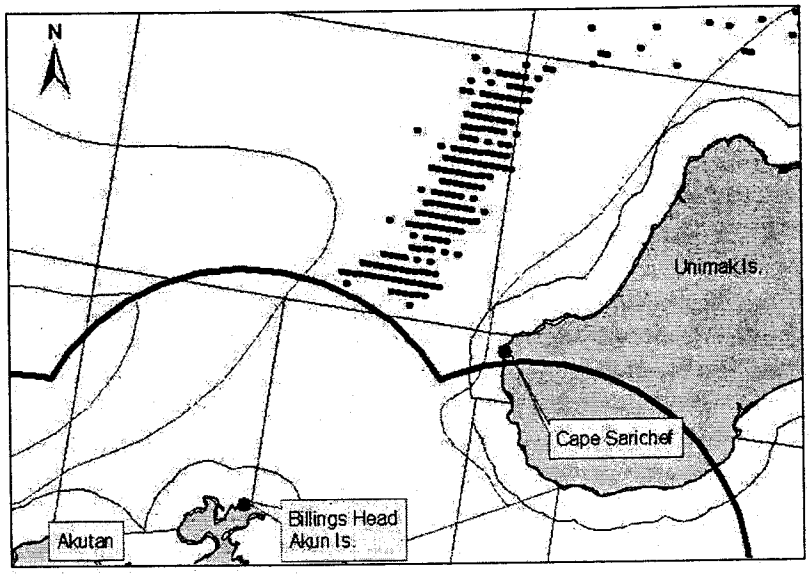
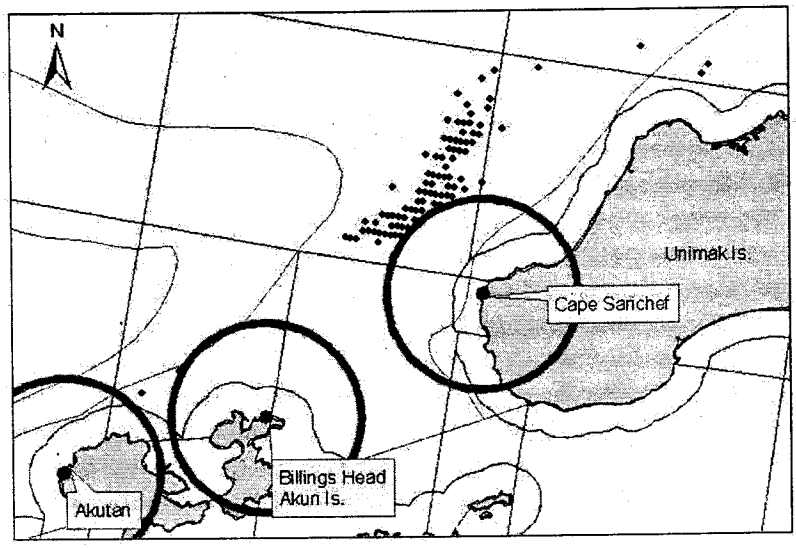


Figure A4-2. Comparison of no-trawl boundaries and observed bottom trawl hauls in the vicinity of Unimak Pass during 2000 (upper map) and 2002 (lower map). Each plotted point represents hauls from three or more vessels.

Unimak Pass SSL 20 nm No-Trawl Zones for 1999/2001 and Location of Observed Bottom Trawls in Jan-Apr 2000



Unimak Pass SSL 10 nm No-Trawl Zones for 2002 and Location of Observed Bottom Trawls in Jan-Apr 2002



A5. Results of Feasibility and Pilot Studies

Preliminary gear trials were conducted from 13 - 22 June 2002 out of Kodiak on the chartered F/V *Big Valley*. This cruise was the first step in developing pots as a sampling gear for cod. The foci of the feasibility study were methods for handling fishing gear in a research context, deployment and retrieval of research instruments, data collection methods, maximizing the efficiencies of all operations, and data management. As an important step to evaluating feasibility of the localized abundance experiment, the number of research pot lifts that could be conducted in a regular working day needed to be determined. A less rigorous goal was to acquire hands-on experience with this gear as a research instrument.

The goals of the study were all met. Prototypes of event timers mounted on the entry triggers to the pot were tested extensively. After some experimentation, these devices were shown to work under field conditions and to successfully capture times when fish entered the pot. The catch timers can be deployed, retrieved, and downloaded without reducing the expected efficiency of a pot sampling operation. The timing of the various aspects of research fishing with pots indicated that as many as 60 pot lifts can be accomplished in a single sea day, though 30 or 40 daily pot lifts is likely to be a more reasonable pace to expect during an extended voyage under fair conditions. This preliminary study indicated that the experimental pot gear works well for Pacific cod, and that field operations of the scope needed for the study are feasible.

A pilot pot fishing and tagging study was performed March 30-April 22, 2002, aboard the F/V *Fierce Alleigance*. The principle goal of the pot-fishing pilot study was to fish pots according to research protocols and collect data on the level of variability in pot catch under these conditions. Estimates of variability and spatial dependence in pot catch are critical to final design and power estimation for the localized depletion experiment. This cruise was also used to test field feasibility and develop methods for cod tagging work using pots for fish collection. A total of 270 data-storage tags and 1,600 spaghetti tags were released during this cruise. Mortality studies of Pacific cod held in on-deck storage tanks and ship holding tanks were also conducted.

The pilot study fished more than 700 pot-sets over 3-6 hour soaks. Pots were baited with a standard commercial bait of ground frozen herring. All fish and invertebrates captured in the pots were identified to species, with the number and total weight recorded by species for each pot. The catch of Pacific cod was consistently good, with most pots containing between 15 and 50 cod (Table A5-1 and Figure A5-1). Out of 555 pot sets with standardized gear and soak times, only three had zero catches. The largest catch was on April 4, of 103 cod. The distribution of catches was slightly right-skewed; 21 pots (3%) contained 70 or more cod. The overall average was 30.1 cod and 107.8 Kg cod per pot. Total catch for the entire cruise was 20,261 cod at 72.7 mt (160,235 pounds). There was no consistent pattern of higher or lower catches for individual clusters of pots, but spatial analysis indicated that pots space closer than 1/3nm influenced each other's catch.

Catches of species other than Pacific cod were small. Yellow Irish Lord were commonly found in pots in both sides of the pass. Yellowfin sole, walleye pollock, Atka mackerel, and assorted flatfish and rockfish species were occasionally caught. Tanner crabs (bairdi) were fairly common at one of the study sites but were absent at most sites. Giant Pacific octopus were caught in 13 pots and observed clinging onto the outside of other pots as they were brought up. Miscellaneous bottom fauna (sponges, starfish, brittle

stars, hair crabs, and scallops) were present in some pots. The consistency of catches in the pilot study suggests that good precision may be attained in the full experiment.

Figure A5-1. Frequency distribution of numbers of cod per pot during pilot study near Unimak Pass.

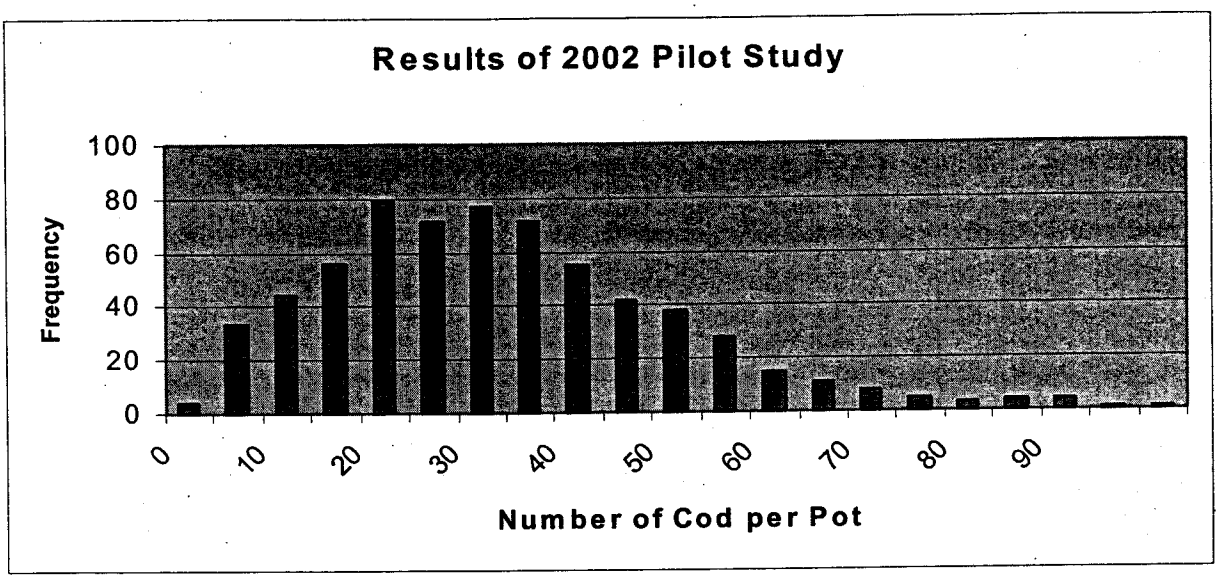


Table A5-1. Results of Pot Fishing Pilot Study near Unimak Pass, April 2002.

SUMMARY OF COD CATCH DATA FOR ALL STANDARD POTS

Stratum	Array	No. of Pots	Number of Cod/Pot Average	Number of Cod/Pot StDev	Weight of Cod (Kg) Average	Weight of Cod (Kg) StDev
1	1	96	33.23	21.70	116.10	88.02
	2	96	26.25	19.01	90.57	69.23
	3	80	31.95	18.80	111.00	68.52
2	1	119	28.19	15.33	100.76	59.18
	2	105	31.51	12.05	118.26	49.57
	3	109	34.29	18.40	127.30	73.29
	4	22	25.14	11.49	92.95	40.51
	5	2	25.00	7.07	87.95	28.35
3	1	10	4.60	3.41	10.58	7.16
	2	10	22.00	11.60	66.53	35.78
All Strata		650	30.08	17.72	107.76	68.82

A5. Experimental Design

A basic outline to the experimental design for the local abundance study is as follows:

- The experiment will be conducted in two legs. A "before" survey will be conducted during January, before the beginning of trawl season, and an identical "after" survey will be conducted in late March. This schedule is designed to bracket the typically most intensive period of trawl fishing in late February and early March.

- Each survey will cover a number of sites inside the 10nm no-trawl zone (the "control") and an equal number of sites outside the no-trawl zone in the heavily trawled region (the "treatment"). While it will not be possible to match treatment and control sites exactly with respect to depth, habitat, bottom currents, etc., each group of sites should cover a similar range of depths and habitats, as nearly as can be determined. The final comparison will be between the population of study sites in the control zone and the population of study sites in the treatment zone.

- Standardized pots with identical mesh, openings, and trigger configurations will be fished at all sites. Bait will be standardized (fixed weight of chopped frozen herring). All pots will be fished for as similar a soak time as is feasible; no less than 4 but no more than 6 hours.

- While it would be desirable to fish all pots at exactly the same time of day, this is not feasible. Instead, all pots will be fished during daylight hours, with the starting time varying over the day. Set and lift times for each pot will be recorded, along with position and depth information.

- As pots are lifted, Pacific cod in each pot will be counted and weighed. Catch of species other than Pacific cod will also be recorded. Individual length/weight and sex data will be collected on a subsample of each day's catch. Additional data and/or specimens may also be collected for related studies.

- A "site" will consist of a fixed position, fished by three to five pot-sets during each survey. The measured quantity for each "site" will be the ratio of the average catch (in numbers or weight of cod) from pots fished at that position during the "before" survey to the average catch during the "after" survey. If one or more pots are lost or damaged during a survey, the catch may be averaged over the remaining pots. At least three successful fishing events are necessary to obtain a valid measurement for a site. A site that does not have a valid catch measurement for both before and after surveys cannot be used.

- Site locations will be selected randomly or systematically before the survey to cover all of the "treatment" area and a similar range of depths and habitats in the "control" area. The number of sites fished and the number of pots per site will be somewhat subject to weather and sea conditions during the surveys. The target is to fish at least 30 sites in each zone, with at least three fishing events during the before survey and at least three during the after survey.

- A Fisher randomization test (Manly 1991, Chapter 1) will be used to test the null hypothesis that the percentage change in CPUE between the before and after surveys at a site is not affected by whether a site was in the trawled or the untrawled zone. This nonparametric test does not require

independence or Normality of distributions in the measured variable. The distribution of the test statistic is determined empirically by repeatedly randomly assigning the observed measures to the treatment and control groups. The observed measure of the actual data is then compared to this distribution to get a p-value for the test. The power of the test under several alternative hypotheses will also be computed.

The major difficulty in design of this experiment is that there are many factors that might affect the local abundance and/or the rate of pot catch of Pacific cod at any given time or place. Known factors that might affect catch rates include local variation in physical and chemical habitat characteristics, bottom currents, and orientation of pot openings in relation to bottom currents. Fish behaviors that are poorly understood but might affect pot catch include diel and tidal patterns in feeding and movement, differences in feeding rates with spawning stage, and changes in response to bait odors at different levels of satiation. Cod are known to undergo a large-scale seasonal migration pattern in the Bering Sea (Shimada and Kimura 1994), but the precise timing of seasonal and short-term migration and aggregation are not known. The experimental design addresses the uncontrollable variation in three ways. The first is to use not the absolute catch rate, but the percentage change in catch rate at a site, as the measured variable. This allows for different sites to have differences in absolute abundance due to local habitat characteristics, and to show changes in abundance between the "before" and "after" portions of the study due to seasonal migration patterns. The assumption is that, in the absence, of any fishery effect, the local abundance of cod will change at the same relative rate over all of the study sites. The second component of the design is the use of "treatment" and "control" areas on either side of the 10nm no-trawl boundary around Cape Sarichef. The 10nm limit conveniently intersects the area that has historically been heavily trawled for cod (Figure A4-2). By using catch rates within the "control" area as a baseline, we hope to account for such regional factors as climate and circulation events, seasonal migration and dispersion patterns, and background feeding levels. The remaining variation (primarily short-term temporal and diel variation, and measurement error due to variation in fishing efficiency of each pot-set) is addressed by replication of sites within the treatment and control zones and use of multiple pot-sets to compute the measurement at each site. In pilot studies, day-to-day variation was one of the major components of variance. Using an average over several pot-sets as the measure at each site provides replication over this source of nuisance variation and reduces the likelihood of zero catches in the final data set.

During fishing for the before and after abundance surveys, pots will be handled as rapidly as possible in order to maximize sample size. Additional data will also be collected, however, during pot fishing for tagging studies. Pots fished for tagging will use the same protocols and soak times as during the experiment, and may increase replication of samples from particular locations. Pots whose fish are to be collected for tagging will be lifted at as slow a rate as possible with the boat's hydraulic gear, in order to minimize damage from pressure changes. Data collected during tagging operations will provide additional points from which to look at changing abundance over time.

A6. Tentative Schedule for Cod Pot Studies 2002-2003

The Alaska Fisheries Science Center will charter a commercial pot fishing vessel to conduct three research cruises in fall of 2002 and winter of 2003. The cruises are to gather data to monitor change in the abundance of Pacific cod (*Gadus macrocephalus*) on a scale local to cod trawl fisheries and to tag

and release Pacific cod. All cruises will begin and end in Dutch Harbor, Alaska. The cruise schedule, with explanation, is as follows:

Table 1. Cruise schedule

Start Date (on or about)	Duration	Explanation and Comment
25 September 2002	16 days	CRUISE 1: Test research cod pots, pot-mounted sensor equipment, and finalize fishing methods.
29 December 2002	12 days	CRUISE 2: Provide indices of Pacific cod abundance prior to the 2003 cod trawl fishery. This cruise is timed to be completed prior to the opening of the 2003 trawling season and the Opilio crab fishery in the Bering Sea.
26 February 2003 Leg I begins 2/26 Leg II begins 3/14	 16 days 20 days	CRUISE 3: Tag and release Pacific cod and provide indices of Pacific cod abundance after the 2003 cod trawl fishery has passed its most intensive phase. This cruise will be in two legs, the first to do the tagging, the second to collect local abundance data.

(***Special note on timing:*** *This schedule is intended to minimize conflict with commercial fishing seasons, the Opilio crab fishery in the Bering Sea in particular. If fishing seasons are not as anticipated the timing of the second and third cruises can be altered to some degree without invalidating the research.*)

The three cruises in this charter will start on or about 25 September 2002, 29 December 2002, and 26 February 2003. The cruises will last 16 days, 12 day, and 36 days respectively, with the third cruise being broken into two legs of 16 and 20 days. These dates have been selected based on the timing of cod spawning and cod trawl fisheries. However, this schedule is also intended to minimize conflicts with commercial fishing seasons. For example, it is in hope of avoiding conflict that the cruise prior to the cod trawl fishery is scheduled to begin on or about 29 December 2002. That cruise is intended to end on 9 January 2003, leaving time for the chartered vessel to prepare for crabbing by 13 January. If the timing of the Opilio fishery is different in 2003 than it has been in previous years, then the Government will consider mutually agreeable schedule changes that both preserve the validity of the research *and* allow the vessel to meet its other commitments. The 16 day leg devoted to tagging can be moved to follow immediately on the heels of the second cruise, in effect becoming a second leg of that cruise. Alternatively, the tagging leg could also be moved to start on or about 3 April, in effect making it the second leg of the third cruise rather than the first.

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bmuse response to jlepore question 12/17/02