

# Habitat Areas of Particular Concern (HAPC)

## Areas of Skate Egg Concentration

Initial Review Draft  
Environmental Assessment (EA) /  
Regulatory Impact Review (RIR) /  
Initial Regulatory Flexibility Analysis (IRFA)

For Amendment to the Fishery Management Plans (FMP) for the Groundfish of the Bering Sea and Aleutian Islands (BSAI), the BSAI Crab FMP, and the Scallop FMP

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Photo credit: Gerald Hoff



*North Pacific Fishery Management Council  
National Marine Fisheries Service, Alaska Region*

## Table of Contents

<b>1.0</b>	<b>EXECUTIVE SUMMARY</b> .....	<b>1</b>
1.1	Alternatives and Options .....	1
1.2	Summary of Environmental Impacts .....	4
1.3	Summary of Economic Impacts .....	5
<b>2.0</b>	<b>INTRODUCTION</b> .....	<b>6</b>
2.1	Overview of Existing HAPCs .....	7
2.2	HAPC Recommendations for Council Consideration .....	9
2.3	Current HAPC Process Timeline .....	11
2.3.1	Revisions to HAPC Cycle Timing .....	12
2.4	Summary of Proposed HAPCs .....	12
2.4.1	Supporting Research .....	15
2.5	Subsequent Developments .....	15
2.5.1	Council Policy Statement for Future Areas.....	17
2.5.2	Number of Expected Areas of Egg Concentration .....	17
2.5.3	Areas of Skate Egg Concentration Nomenclature .....	20
<b>3.0</b>	<b>ENVIRONMENTAL ASSESSMENT (EA)</b> .....	<b>23</b>
3.1	Relevant NEPA Documents .....	23
3.1.1	Alaska Groundfish Programmatic Supplemental Environmental Impact Statement EIS (PSEIS).....	23
3.1.2	Alaska Groundfish Harvest Specifications Environmental Impact Statement .....	24
3.1.3	BSAI Final 2011-2012 Harvest Specifications Environmental Assessment .....	24
3.1.4	Essential Fish Habitat Environmental Impact Statement .....	24
3.2	Purpose and Need for the Action.....	25
3.2.1	Statement of Purpose and Need.....	25
3.3	Action Alternatives and Options .....	26
3.4	Discussion of Alternatives and Options .....	29
3.4.1	Alternative 1 .....	29
3.4.2	Alternative 2 .....	29
3.4.3	Alternative 3 and Options a-d .....	30
3.4.4	Option e – research list.....	32
3.4.5	Option f – BSAI Amendment 89.....	33
3.5	Delineation of HAPCs.....	34
3.5.1	Concentration Threshold .....	35
3.5.2	Shape of Area .....	35
3.6	Skate Biology .....	35
3.6.1	Alaska Skate .....	37
3.6.2	Bering Skate .....	37
3.6.3	Aleutian Skate .....	37
3.6.4	Life History and Stock Structure.....	38
3.6.5	Embryology and Development Duration.....	39
3.6.6	Role of Skates in the Ecosystem .....	39
3.7	Probable Environmental Impacts .....	41
3.7.1	Habitat .....	42
3.7.2	Target Species .....	55
3.7.1	Non-Target Resources.....	59
3.7.2	Marine Mammals and Seabirds .....	61
3.7.3	Ecosystem.....	64
3.8	Economic and Socioeconomic Aspects of Federally Managed Fisheries .....	66
3.9	Cumulative Impacts.....	66

3.9.1	Reasonably Foreseeable Future Actions .....	67
3.9.2	Global Warming.....	69
3.10	Management and Enforcement Considerations.....	70
<b>4.0</b>	<b>REGULATORY IMPACT REVIEW (RIR) .....</b>	<b>71</b>
4.1	Introduction and Problem Statement.....	71
4.1.1	Statement of Purpose and Need.....	72
4.2	Alternatives and Options.....	72
4.3	Background .....	76
4.3.1	BSAI Groundfish Fisheries .....	76
4.3.2	Skate Fishery Management and Stock Status.....	78
4.3.3	Incidental catch and discards.....	79
4.4	Effects on Harvesters, Processors, and Communities .....	80
4.4.1	Catch by Trawl Gear in HAPC Sites.....	80
4.4.2	Additional Costs.....	86
4.4.1	Catch by Longline (Hook and Line).....	86
4.4.2	Catch by Pot Gear .....	87
4.4.3	Catch by Dredge and Dinglebar Gear .....	87
4.4.4	Effects on Processors and Communities .....	88
4.5	Effects on Management, Monitoring, and Enforcement .....	88
4.5.1	Enforcement Concerns .....	89
4.5.2	Aircraft Surveillance .....	90
4.5.3	At-sea Enforcement.....	90
4.5.4	Trawl Gear Restrictions.....	90
4.5.5	Vessel Monitoring Systems (VMS) .....	91
4.5.6	Enforceable Threshold Size and Shape.....	91
4.6	Net Benefits to the Nation.....	92
<b>5.0</b>	<b>INITIAL REGULATORY FLEXIBILITY ANALYSIS (IRFA).....</b>	<b>93</b>
5.1	Introduction .....	93
5.2	IRFA Requirements.....	93
5.3	Definition of a Small Entity .....	94
5.3.1	Small Businesses.....	94
5.3.2	Small Organizations .....	95
5.3.3	Small Governmental Jurisdictions.....	96
5.4	Reasons for Consideration of Proposed Actions.....	96
5.5	Legal Basis for Proposed Actions .....	97
5.6	Small Entities Impacted by Actions .....	97
5.7	Recordkeeping and Reporting Requirements .....	97
5.8	Duplicate, Overlap, or Conflict with Federal Rules.....	98
5.9	Alternatives that Accomplish Objectives at Lower Cost to Small Entities.....	98
<b>6.0</b>	<b>CONSISTENCY WITH APPLICABLE LAW .....</b>	<b>99</b>
6.1	Environmental Analysis Conclusions.....	99
6.1.1	Comparison of Alternatives.....	102
6.2	The Ten National Standards .....	103
6.3	Fisheries Impact Statement (FIS).....	104
<b>7.0</b>	<b>REFERENCES.....</b>	<b>106</b>
<b>8.0</b>	<b>PREPARERS, CONTRIBUTORS, AND PERSONS CONSULTED.....</b>	<b>112</b>
<b>9.0</b>	<b>APPENDICES .....</b>	<b>113</b>
9.1	Appendix A – HAPC Process Methodology .....	113
9.2	Appendix B – Color Figures .....	115

## List of Tables

Table 1.	The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 2.....	2
Table 2.	The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 3.....	3
Table 3.	HAPCs within the NMFS Alaska Region.....	8
Table 4.	Comparison of existing HAPCs with proposed HAPCs, in terms of area.....	9
Table 5.	Recommendations on HAPC priorities from previous Council discussions.....	10
Table 6.	Recommendations on HAPC priorities from the individual species reviews.....	10
Table 7.	The 2010 to 2012 HAPC proposal cycle.....	11
Table 8.	The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 2.....	13
Table 9.	The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 3.....	14
Table 10.	Egg estimates for each area of concentration and the annual cohort estimate comparing areas of concentration to trawl survey estimates (YOY=young-of-the-year).....	19
Table 11.	Estimation of areas of skate egg concentration by species based on egg densities and young of the year estimates from bottom trawl surveys.....	20
Table 12.	The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 2.....	27
Table 13.	The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 3.....	28
Table 14.	Summary table of gear type prohibited under each option for Alternative 3.....	31
Table 15.	Summary table of HAPC sites, skate species, and fisheries.....	32
Table 16.	Skate species found in the North Pacific Ocean.....	36
Table 17.	Trawl footprint analysis according to available VMS data, under Alternative 2.....	54
Table 18.	Criteria used to estimate the significance of effects on FMP-managed target stocks.....	55
Table 19.	Expected impacts on skate eggs of the options under Alternative 3.....	58
Table 20.	Summary table of potential impacts of fishing gear on skate eggs.....	59
Table 21.	Criteria used to estimate the significance of effects on forage and non-specified species.....	60
Table 22.	Criteria used to estimate the significance of impacts on prohibited species.....	60
Table 23.	ESA listed and candidate species that range into the BSAI groundfish management area.....	61
Table 24.	Criteria for determining significance of impacts to marine mammals.....	63
Table 25.	Criteria used to determine significance of impacts on seabirds.....	64
Table 26.	Significance thresholds for fishery induced effects on ecosystem attributes.....	65
Table 27.	Reasonable foreseeable future actions (RFFAs).....	68
Table 28.	The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 2.....	73
Table 29.	The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 3.....	75
Table 30.	Draft recommendations for OFL, ABC, and TAC (mt) for 2012-13 in the BSAI groundfish fisheries (as of December 2011).....	77
Table 31.	Aggregate 2011 through 2013 harvest recommendations for the BSAI skate complex.....	78
Table 32.	Status and catch specifications (t) of skates in recent years in the BSAI.....	78
Table 33.	Nonpelagic (i.e., bottom trawl) trawl catch (mt) per year, under Alternative 3. Sites not listed experienced no catch in the years examined.....	82

Table 34.	Gross ex-vessel value of nonpelagic (i.e., bottom trawl) trawl catch per year, under Alternative 3. Sites not listed experienced no catch in the years examined.....	83
Table 35.	Pelagic trawl catch, in tons of groundfish (pollock) per year.....	85
Table 36.	Criteria to evaluate HAPC proposals for the Council’s consideration.....	113
Table 37.	The Data Certainty Factor (DCF).....	114
Table 38.	HAPC Evaluation Criteria.....	114
Table 39.	Evaluation of HAPC proposal.....	115

## **List of Figures**

Figure 1.	The locations in the Bering Sea of the six proposed skate egg concentration HAPCs (not to scale). .....	2
Figure 2.	Locations in the eastern Bering Sea of the proposed skate egg HAPCs (not to scale). .....	14
Figure 3.	Locations of the three additional areas of skate egg concentration in the Gulf of Alaska. ....	16
Figure 4.	Life cycle with respect to habitat use for skates along the slope (200 to 1200 m) and the shelf (0 to 200 m) in the eastern Bering Sea. ....	20
Figure 5.	The locations in the eastern Bering Sea of the six skate egg concentration HAPCs (not to scale). .....	27
Figure 6.	Schematic of nonpelagic, or bottom, trawling. ....	43
Figure 7.	Schematic of pelagic trawling.....	46
Figure 8.	Schematic of a scallop dredge, in the New Bedford style. ....	48
Figure 9.	Schematic of longlines gear (hook and line) set in the water. ....	50
Figure 10.	Schematic of a crab or Pacific cod pot. ....	51
Figure 11.	Schematics of troll and dinglebar gear. ....	53
Figure 12.	The locations in the eastern Bering Sea of the six skate egg concentration HAPCs (not to scale). .....	74
Figure 13.	Map showing scallop fishing areas, areas closed to scallop fishing by regulation, and locations where weathervane scallops were captured during NMFS and ADF&G trawl. ....	88

## 1.0 EXECUTIVE SUMMARY

Habitat Areas of Particular Concern (HAPC) are geographic sites that fall within the distribution of essential fish habitat (EFH) for federally managed species. HAPCs are areas of special importance that may require additional protection from adverse fishing effects. EFH provisions provide a means for the North Pacific Fishery Management Council (Council) to identify HAPCs (50 C.F.R. 600.815(a)(8)) within Fishery Management Plans (FMP). Specific to fishery actions, HAPCs are areas within EFH that are rare and are either ecologically important, sensitive to disturbance, or may be stressed.

The Council has a formalized process identified within its FMPs for selecting HAPCs. Under this process, the Council periodically considers whether to set a priority habitat type (or types). If so, the Council initiates a request for proposals (RFP) for HAPC candidate areas that meet the specific priority habitat type. Members of the public, non-governmental organizations, and Federal, State, and other agencies may submit HAPC proposals. Sites proposed under this process are then sent to the Council's plan teams for scientific review to determine ecological merit. Council and agency staff also review proposals for socioeconomic and management and enforcement impacts. This combined information is then presented to the Scientific and Statistical Committee (SSC), the Advisory Panel (AP), the Enforcement and Ecosystem Committees if necessary, and to the Council, which may choose to select HAPC proposals for a full analysis and subsequent implementation. The Council may also modify proposed HAPC sites and management measures during its review, or request additional stakeholder input and technical review.

In April 2010, the Council set a habitat priority type—"skate nurseries"—and issued an RFP in conjunction with the completion of its EFH five-year review process. Council staff initially screened the proposals received to determine consistency with the Council's habitat priority type, compliance with the Council's HAPC criteria, and for general adequacy and completeness. At its fall 2010 meeting, the Joint Groundfish Plan Teams reviewed HAPC proposals for rarity and ecological merit in October 2010, the Council selected a HAPC proposal from the Alaska Fisheries Science Center (AFSC) to forward on for further analysis. In February 2011, the Council received a discussion paper on the AFSC's HAPC proposal and selected alternatives and options for conservation and management through gear prohibitions to forward on for full analysis.

Three alternatives for the identification of skate egg concentration HAPCs and four options (a through d) for gear type prohibitions within those HAPCs are analyzed in this document, and are listed below. Consideration of areas of skate egg concentration is limited to the six candidate sites from the AFSC proposal. Additional sites, when and if discovered, are not considered part of this action. In addition, the Council has the options of recommending research and monitoring of skates be added to its research priority list (Option e) and adopting an FMP housekeeping amendment to standardize federal descriptions of Bering Sea habitat conservation measures (Option f).

### 1.1 Alternatives and Options

In order to address the issues described in its statement of purpose and need, the Council identified three alternatives and five options for analysis, shown below. In addition, an FMP housekeeping option has been added to the analysis (Option f).

#### **Alternative 1: Status quo; no action.**

No measures would be taken to identify, or to identify and conserve, areas of skate egg concentration as HAPCs.

**Alternative 2: Identify skate egg concentration HAPC(s).**

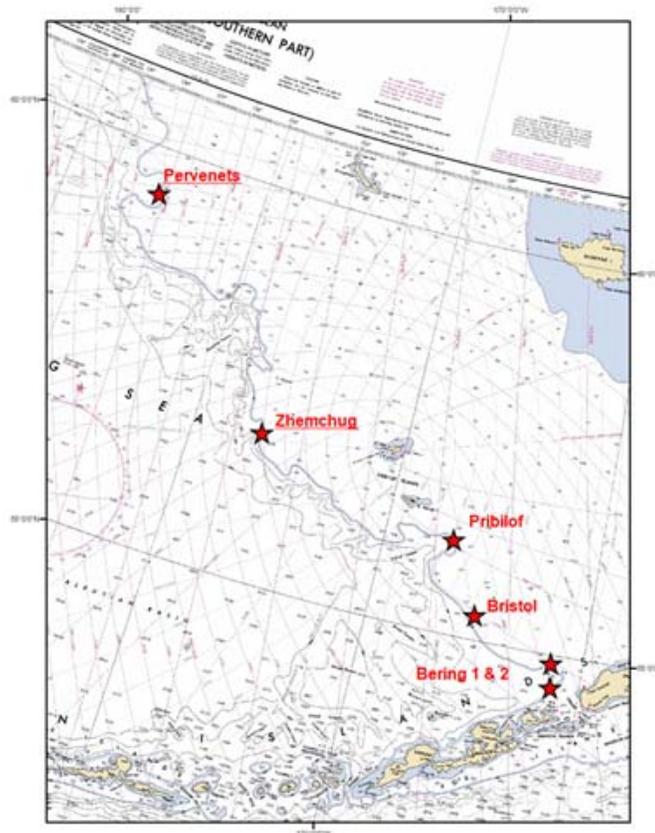
The Council may select to identify – individually, severally, or all six of – the areas of skate egg concentration as HAPCs.<sup>1</sup> The intent of Alternative 2 is to “discourage fishing in these areas” of skate egg concentration with gear that makes contact with the sea floor.

**Table 1. The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 2.**

Site name <sup>a</sup>	Predominant skate species	Depth of max. egg density (m)	Maximum egg density (eggs/km <sup>2</sup> )	Area of HAPC nm <sup>2</sup>	Boundaries of HAPC (°N latitude or °W longitude)			
					North	South	West	East
1. Bering 1	Alaska	145	800,406	18.4	54°53'	54°49'	165°46'	165°38'
2. Bering 2	Aleutian	380	62,992	17.5	54°38'	54°33'	165°45'	165°34'
3. Bristol	Bering	156	6,188	13.7	55°21'	55°17'	167°40'	167°34'
4. Pribilof	Alaska	205	16,473	1.2	56°11'	56°10'	168°28'	168°26'
5. Zhemchug	Alaska	217	610,064	3.2	56°57'	56°54'	173°23'	173°21'
6. Pervenets	Alaska, Bering, Aleutian	316	334,163	27.7	59°28'	59°22'	177°43'	177°34'

**Total area of the eastern Bering Sea proposed as HAPCs under Alternative 2 = 81.7 nm<sup>2</sup>**

<sup>a</sup> Counterintuitively, the Bering 2 site is south of the Bering 1 site. Sites 3 through 6 run south to north.



**Figure 1. The locations in the Bering Sea of the six proposed skate egg concentration HAPCs (not to scale).**

<sup>1</sup> 50 C.F.R. 600.815(a)(8). Essential Fish Habitat (EFH) provisions provide a means by which the Council may identify HAPCs within FMPs.

At each of the six areas of skate egg concentration, the spatial extent of bottom trawls containing more than 1,000 egg cases per kilometer squared (km<sup>2</sup>) have been established. Boundary lines are then snapped outward to the nearest minute of latitude or longitude.

**Alternative 3: Identify and conserve skate egg concentration HAPC(s).**

The Council may select to identify – individually, severally, or all six of – the areas of skate egg concentration as HAPCs – AND – the Council may select different conservation and management options for any area identified as a skate egg concentration HAPC:

**Option a: Prohibit within skate egg concentration HAPC(s) the use of “mobile bottom contact”<sup>2</sup> fishing gear: nonpelagic (i.e., bottom) trawl, dredge, and dinglebar gear.**

**Option b: Prohibit within skate egg concentration HAPC(s) the use of “mobile bottom contact” and pelagic trawl fishing gear: nonpelagic and pelagic trawl, dredge, and dinglebar gear.<sup>3</sup>**

**Option c: Prohibit within skate egg concentration HAPC(s) the use of “bottom contact”<sup>4</sup> fishing gear: nonpelagic trawl, dredge, dinglebar, pot, and hook and line (i.e., longline) gear.**

**Option d: Prohibit within skate egg HAPC(s) the use of all fishing gear: nonpelagic and pelagic trawl, dredge, dinglebar, pot, and hook and line gear.**

To achieve effective enforcement of these areas, Alternative 3 establishes a minimum size threshold for the core concentration areas to be protected of at least 5 nm to a side and are then, where appropriate, enlarged with a buffer of 1 nm beyond the original boundary under Alternative 2. Boundaries are then snapped outward to the nearest minute of latitude and longitude.

**Table 2. The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 3.**

Site name <sup>a</sup>	Predominant skate species	Depth of max. egg density (m)	Maximum egg density (eggs/km <sup>2</sup> )	Area of HAPC (nm <sup>2</sup> )	Boundaries of HAPC (°N latitude or °W longitude)			
					North	South	West	East
1. Bering 1	Alaska	145	800,406	41.8	54°54'	54°48'	165°48'	165°36'
2. Bering 2	Aleutian	380	62,992	40.9	54°39'	53°32'	165°47'	165°37'
3. Bristol	Bering	156	6,188	34.4	55°22'	55°16'	167°42'	167°32'
4. Pribilof	Alaska	205	16,473	28	56°13'	56°08'	168°32'	168°22'
5. Zhemchug	Alaska	217	610,064	27.4	56°58'	56°53'	173°27'	173°17'
6. Pervenets	Alaska, Bering, Aleutian	316	334,163	53.3	59°29'	59°21'	177°45'	177°36'
<b>Total area in the eastern Bering Sea proposed as HAPCs under Alternative 3 = 225.8 nm<sup>2</sup></b>								

<sup>a</sup> Counterintuitively, the Bering 2 site is south of the Bering 1 site. Sites 3 through 6 run south to north.

**Additional Options**

The following options are applicable to ALL of the alternatives, in any combination of skate egg

<sup>2</sup> 50 C.F.R. 679.2.

<sup>3</sup> See 50 C.F.R. 679.2 for the particular and intricate components defining “pelagic trawl” fishing gear.

<sup>4</sup> 50 C.F.R. 679.2.

concentration HAPCs, and with any combination of conservation and management measures the Council selects:

**Option e: Suggest adding research and monitoring of areas of skate egg concentration to the Council's research priority list.**

The Council may suggest incorporating the research and monitoring of skate species into the Council's annual research priority list, to evaluate skate populations, skate egg concentration areas, and their ecology and habitat.

**Option f: Adopt formatting standards as stated in the final rule implementing Amendment 89 to the BSAI Groundfish FMP.**

The Council may approve the consolidation of figures and tables that describe areas in Amendment 89 to the BSAI Groundfish FMP, which establishes Bering Sea habitat conservation measures. Color Figures 66-69 in Appendix B describe the Bering Sea Habitat Conservation Area, the Northern Bering Sea Research Area and Saint Lawrence Island Habitat Conservation Area (HCA), and the Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area, respectively.

## **1.2 Summary of Environmental Impacts**

The analysis of direct, indirect, and cumulative effects for the proposed action indicate no significant impacts on the human environment from the three alternatives and any of the possible options for conservation and management. Environmental effects of this proposed action are considered insignificant under all alternatives. These sites are small and discrete areas that have had either little fishing effort in them in the past or some limited trawling for groundfish, including for pollock, in some areas, in some years. No substantial changes in effort re-distribution are anticipated. As such, any effects on habitat, target species, non-target resources, protected species, or the ecosystem would be considered insignificant. The effects on skates are unknown but are expected to provide some positive benefit.

Alternative 1, the status quo or no action alternative, involves no measures to identify or conserve areas of skate egg concentration as HAPCs. Thus Alternative 1 is not likely to result in any significant effects regarding habitat, target species, non-target resources, protected species, or the ecosystem. The Council may, however, choose Option e under Alternative 1, which would add areas of skate egg concentration to the Council's annual research priority list. The Council could also choose Option f under Alternative 1, a housekeeping amendment to the Bering Sea Aleutian Island (BSAI) Fishery Management Plan (FMP)

Alternative 2 provides some degree of protection for vulnerable benthic skate egg habitat by identifying areas of skate egg concentration as HAPCs. The identification of these sites as a HAPC highlights the importance of this essential fish habitat for conservation and consultation on activities such as: drilling, dredging, laying cables, and dumping, as well as fishing activities. The impacts of Alternative 2 would be similar in magnitude to Alternative 1 because under Alternative 2 fishing activities are not restricted. However, fishing activities in these areas could be more closely monitored through the Ecosystem Stock Assessment and Fishery Evaluation (SAFE) and the essential fish habitat (EFH) five-year review.

Alternative 3 provides for both the identification of skate egg concentration HAPCs and for the conservation of these areas through prohibitions on gear types within HAPCs. The impacts of Alternative 3 depend on the option for conservation and management (a through d) selected for each HAPC. The Council may select, in combination with any skate egg concentration designated as a HAPC, to limit fishing activities that make contact with the sea floor in these areas by prohibiting the use of "mobile bottom contact," pelagic, "bottom contact," or all fishing gear. Options that prohibit trawling in these

areas would provide the most protection from potential direct impacts (bury or crush) and indirect impacts (dislodgement, movement, bycatch mortality) on egg cases. Other gear types likely have less potential to impact skate egg cases, so a prohibition on these gears may offer only marginal benefits. The potential effects of the options on skate populations remains unknown but are likely beneficial.

### **1.3 Summary of Economic Impacts**

Economic impacts are expected to be minor under all alternatives, as these are small areas overall and have low levels of fishing effort, particularly the four more northern sites. The most costly option (Alternative 3, Option e) would close these six areas to all fishing gears, encompassing a total area of 225.8 nm<sup>2</sup>. Limited impacts to longline fisheries may occur if closures are implemented; effort data indicates that several of these areas are fished at low levels to target Pacific cod. No impacts would be expected for pot gear targeting Pacific cod, or scallop fisheries using dredge gear, as none of these areas have been used in recent years, as shown through analysis of catch data in the HAPCs. The effect of Alternative 3 on crab fisheries (pot gear) remains unknown at this time as quantitative information is not available, but the effects are likely insignificant due to the small area proposed and the depths of the areas relative to crab harvest.

Trawl fisheries would also be impacted, but these impacts would also be considered relatively minimal relative to the total annual groundfish catch by affected fleets. Initial analysis suggests that on average, a closure to pelagic and bottom trawling of these sites would result in a maximum foregone catch of **\$1,599,570** per year on average. Of this total, pelagic trawling for pollock in the areas would generate a foregone catch of **\$1,102,109** per year, and bottom trawling of **\$497,461**, which is the total ex-vessel price divided by the nine years (2003-2011) of catch data examined. For comparison, BSAI trawl fisheries ex-value was averaged at **\$515,840,000** over 2006-2010 (from the 2011 Economic SAFE, for all trawl species). The average of \$1,102,109 per year of estimated foregone pelagic catch equates to approximately **0.21%** of an average (2006-2010) annual gross value of the BSAI trawl groundfish (\$515,840,000).

It would be expected that the fleet could make up this foregone catch in other areas, adjacent or elsewhere. However, moving the fleet elsewhere to make up foregone catch may require vessels to fish outside of their preferred zone and could potentially cause some increased operation costs (e.g., lower CPUEs, higher PSC rates, longer trip times, etc.)

## 2.0 INTRODUCTION

Habitat Areas of Particular Concern (HAPC) are geographic sites that fall within the distribution of essential fish habitat (EFH) for federally managed species. HAPCs are areas of special importance that may require additional protection from adverse fishing effects. EFH provisions provide a means for the North Pacific Fishery Management Council (Council) to identify HAPCs (50 C.F.R. 600.815(a)(8)) within Fishery Management Plans (FMP). Specific to fishery actions, HAPCs are areas within EFH that are rare and are either ecologically important, sensitive to disturbance, or that may be stressed.

The Council has a formalized process identified within its FMPs for selecting HAPCs. Under this process, the Council periodically considers whether to set a priority habitat type (or types). If so, the Council initiates a request for proposals (RFP) for HAPC candidate areas that meet the specific priority habitat type. Members of the public, non-governmental organizations, and Federal, State, and other agencies may submit HAPC proposals. Sites proposed under this process are then sent to the Council's plan teams for scientific review to determine ecological merit. Council and agency staff also review proposals for socioeconomic and management and enforcement impacts. This combined information is then presented to the Scientific and Statistical Committee (SSC), the Advisory Panel (AP), the Enforcement and Ecosystem Committees (if necessary), and to the Council, which may choose to select HAPC proposals for a full analysis and subsequent implementation. The Council may also modify proposed HAPC sites and management measures during its review, or request additional stakeholder input and technical review. (See Appendix A for details on the HAPC process methodology for this 2010-2012 RFP cycle.)

This Environmental Assessment / Regulatory Impact Review / Initial Regulatory Flexibility Analysis (EA/RIR/IRFA) examines the environmental, economic, and socioeconomic aspects of proposed Federal regulatory actions primarily to the groundfish fisheries in the eastern Bering Sea. The groundfish fisheries in the Exclusive Economic Zone (EEZ) off the coast of Alaska are managed by the National Marine Fisheries Service (NMFS) under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Pursuant to the MSA, the Council developed and adopted the Fishery Management Plan (FMP) for the Groundfish of the Bering Sea and Aleutian Islands (BSAI). This proposed action would designate areas of skate egg concentration as HAPCs in the BSAI, specifically the eastern Bering Sea. Other FMPs that would be affected by this action are the BSAI Crab FMP and the Scallop FMP.

An Environmental Assessment (EA) is required by the National Environmental Policy Act of 1969 (NEPA) to determine whether the proposed Federal action will result in a significant impact on the human environment. The purpose of an EA is to analyze the environmental impacts of a proposed Federal action. The human environment is defined by the Council on Environmental Quality (CEQ) as the natural and physical environment, and the relationships of people with that environment (40 C.F.R. 1508.14). This means that economic or social effects are not intended, by themselves, to require preparation of an EA. When an EA is prepared and socioeconomic and natural or physical environmental impacts are interrelated, the EA must discuss, however, all of these impacts on the quality of the human environment. If, based on an analysis of the relevant considerations the Federal action is determined to be insignificant, then the EA and accompanying finding of no significant impact (FONSI) would be the final environmental documents required by NEPA. An Environmental Impact statement (EIS) must be prepared for major Federal actions significantly affecting the human environment. In addition, NEPA requires a description of the purpose and need for the proposed action, as well as a description of alternatives which may address the problem. This document also includes a description of the affected human environment and information on the impacts of the alternatives on that environment.

Executive Order 12866 (EO) requires preparation of a Regulatory Impact Review (RIR) to assess the social and economic costs and benefits of available regulatory alternatives to determine whether a

proposed regulatory action is economically significant as defined by the order. This analysis also addresses requirements of the Regulatory Flexibility Act (RFA), which requires an analysis of potential adverse economic impacts accruing to small entities that would be directly regulated by the proposed action. This analysis also addresses the Magnuson-Stevens Act (MSA), which is applicable to this proposed action. References and literature cited are included, as well as a list of preparers, agencies, and individuals consulted during the evaluation.

## **2.1 Overview of Existing HAPCs**

For the 2004 HAPC identification process, the Council designated two priorities: named seamounts in Alaska Federal waters a, and coral areas with rockfish associations. The Council received twenty-three proposals from six different organizations. After an initial screening by staff, the proposals were reviewed by the Council's plan teams, and assessed for management, enforcement, and socioeconomic issues. Ultimately, the Council identified a range of alternatives, staff completed an analysis, and in January 2005, the Council adopted several new HAPCs. Twenty sites in the GOA and Aleutian Islands, consisting of seamounts and high density coral areas, were identified as HAPCs. To protect these sites and eliminate environmental impacts due to fishing, the Council prohibited fishing in these areas by gear types that contact the sea floor. These sites and measures became effective in June 2006.

The Alaska Seamount Habitat Protection Area encompasses all sixteen seamounts in Federal waters off of Alaska named on NOAA charts: Bowers Brown, Chirikof, Marchand, Dall, Denson, Derickson, Dickins, Giacomini, Kodiak, Odyssey, Patton, Quinn, Sirius, Unimak, and Welker. Bottom-contact fishing is prohibited in all of the seamount HAPCs, which encompass a total area of 5,329 nm<sup>2</sup>. In Southeast Alaska, three sites with large aggregations ("tickets") of long-lived *Primnoa* coral are also identified as HAPCs. These three sites, in the vicinity of Cape Ommaney and Fairweather grounds, total 67 nm<sup>2</sup>. The GOA Coral Habitat Protection Areas designates five zones within these sites where submersible observations have been made, totaling 13.5 nm<sup>2</sup>. All bottom contact gear—longlines, trawls, pots, dinglebar gear—are prohibited in these areas, which would be Option e under Alternative 3. Finally, in the Aleutian Islands region, the relatively unexplored Bowers Ridge was also identified as a HAPC. As a precautionary measure, the Council acted to prohibit mobile fishing gear that contacts the bottom within this 5,286 nm<sup>2</sup> area.

The Current HAPC areas and bottom trawl closure areas are shown in Appendix B – Color Figures 1 and 2, and in the tables below:

**Table 3. HAPCs within the NMFS Alaska Region.**

HAPC name	Individual HAPCs within	Total Area (approx.)	Fishery Management Application	Specific Regulation
Alaska Seamount Habitat Protection Areas	<ul style="list-style-type: none"> <li>• Dickens Seamount</li> <li>• Denson Seamount</li> <li>• Brown Seamount</li> <li>• Welker Seamount</li> <li>• Dall Seamount</li> <li>• Quinn Seamount</li> <li>• Giacomini Seamount</li> <li>• Kodiak Seamount</li> <li>• Odessey Seamount</li> <li>• Patton Seamount</li> <li>• Chirikof &amp; Marchand Seamounts</li> <li>• Sirius Seamount</li> <li>• Derickson Seamount</li> <li>• Unimak Seamount</li> <li>• Bowers Seamount</li> </ul>	5,300 nm <sup>2</sup>	No federally permitted vessel may fish with bottom contact gear <sup>5</sup> .	<p>Federal Register</p> <p>50 CFR Part 679 Vol. 71, No. 124</p> <p>Wednesday, June 28,2006</p>
Bowers Ridge Habitat Conservation Zone	<ul style="list-style-type: none"> <li>• Bowers Ridge</li> <li>• Ulm Plateau</li> </ul>	5,300 nm <sup>2</sup>	No federally permitted vessel may fish with mobile bottom contact gear <sup>6</sup> .	Same as above
Gulf of Alaska Coral Habitat Protection Areas	<ul style="list-style-type: none"> <li>• Cape Ommaney 1</li> <li>• Fairweather FS1</li> <li>• Fairweather FS2</li> <li>• Fairweather FN1</li> <li>• Fairweather FN2</li> </ul>	14 nm <sup>2</sup>	No federally permitted vessel may fish with bottom contact gear in portions of the site.	Same as above

<sup>5</sup> “Bottom contact” gear means nonpelagic (i.e., bottom) trawl, dredge, dinglebar, pot, or hook-and-line (i.e., longline) gear (50 C.F.R. 679.2).

<sup>6</sup> “Mobile [bottom] contact” gear means nonpelagic trawl, dredge, or dinglebar gear (50 C.F.R. 679.2).

**Table 4. Comparison of existing HAPCs with proposed HAPCs, in terms of area.<sup>17</sup>**

<b>HAPC</b>	<b>Area nm<sup>2</sup></b>	<b>Gear Restrictions</b>	<b>HAPC - Alt. 2</b>	<b>Area nm<sup>2</sup></b>
<b>Bowers Ridge/ Ulm Plateau HCZ</b>	<b>5,286</b>	No mobile bottom contact gear	Bering 1	18.4
			Bering 2	17.5
<b>Alaska Seamount</b>	<b>5,330</b>	No bottom contact gear	Bristol	13.7
Dickins	147		Pribilof	1.2
Denson	287		Zhemchug	3.2
Brown	167		Pervenets	27.7
Welker	162		<b>HAPC - Alt. 2 Total</b>	<b>81.7</b>
Dall	950			
Quinn	201		<b>HAPC - Alt. 3</b>	<b>Area nm<sup>2</sup></b>
Giacomini	164		Bering 1	41.8
Kodiak	158		Bering 2	40.9
Odessey	210		Bristol	34.4
Patton	94		Pribilof	28
Chirikof & Marchan	2,248		Zhemchug	27.4
Sirius	167		Pervenets	53.3
Derickson	218		<b>HAPC - Alt. 3 Total</b>	<b>225.8</b>
Unimak	129			
Bowers	29			
<b>GOA Coral HPA</b>	<b>14</b>	No bottom contact gear		
Cape Ommaney	0.85			
Fairweather A	0.77			
Fairweather B	3.20			
Fairweather C	7.88			
Fairweather D	0.86			
<b>HAPC Total</b>	<b>10,630</b>			
<b>Other EFH Areas</b>				
<b>GOA Slope HPA</b>	<b>1,892</b>	No nonpelagic trawl gear		
<b>Aleutian Islands HCA</b>	<b>279,114</b>	No nonpelagic trawl gear		
<b>Aleutian Islands Cor</b>	<b>112</b>	No bottom contact gear		
<b>Arctic</b>	<b>148,393</b>	No commercial fishing		
<b>St Matthew HCA</b>	<b>4,110</b>	No nonpelagic trawl gear		
<b>St Lawrence HCA</b>	<b>7,033</b>	No nonpelagic trawl gear		

## 2.2 HAPC Recommendations for Council Consideration

From 2006 to 2007, the Council considered whether to initiate a HAPC proposal process during discussion related to Bering Sea Habitat Conservation. The Council reviewed the previous 2004 HAPC cycle and determined a review was needed to address plan team and public concerns. Some of these concerns included: how the Council assembles proposed HAPC nominations; the need to ensure uniformity in the information provided in the proposals; and the need for better definitions of the HAPC criteria, such as the requirement for rarity of candidate HAPCs. The Council formally revised the HAPC process to address many of these concerns and asked the SSC to provide further definitions of the HAPC criteria prior to the next Council RFP. Following discussion through an SSC, agency, and plan team workgroup, the Council adopted the SSC's recommended revisions to the HAPC criteria. (See Appendix A for the Council's revised HAPC determination criteria.)

<sup>17</sup> No bottom contact gear applies to only portions of the GOA Coral HPA sites.

The Council also considered whether to set a HAPC priority for Bering Sea “skate nurseries” (now termed “areas of skate egg concentration” or “skate egg concentration sites”) and for undersea canyons in the Bering Sea. The AFSC was contacted in October 2006 and asked to produce a white paper summarizing current scientific information on the canyons and “skate nurseries” in the eastern Bering Sea. The Council received the paper at its December 2006 meeting. Following public input and plan team and SSC review, the Council determined that it would be premature to initiate a call for proposals because there were no identified conservation concerns at that time:

**Table 5. Recommendations on HAPC priorities from previous Council discussions**

HAPC discussion at the Council	Priority types forwarded for consideration in 2010
2006-2007 discussion of Bering Sea Habitat Conservation	skate nurseries (in the Bering Sea) deepwater canyons (Pribilof and Zhemchug)

In June 2009, the Council considered whether to set priorities for identifying HAPCs and to re-solicit for HAPC proposals. The Council opted to postpone this decision pending the completion of its five-year EFH review. Recommendations on HAPC priorities were identified as a result of the EFH five-year review for individual species:

**Table 6. Recommendations on HAPC priorities from the individual species reviews**

Council FMP	Species	Recommendation
Bergin Sea/Aleutian Islands (BSAI) Groundfish	Skates	The Council may want to consider closing known skate nurseries to fishing activity; the Council has discussed this in the past.
<i>Note, this recommendation was originally made by the individual species author, and forwarded by the BSAI Groundfish Plan Team.</i>		

At its April 2010 meeting, the Council set a habitat priority type—“skate nurseries”<sup>8</sup>—and issued an RFP in conjunction with the completion of the EFH five-year review process. The RFP, which included the Council’s recently adopted revised evaluation criteria, was announced in the Federal Register (see 75 FR 21600) and in the Council newsletter. The proposal period opened April 26, 2010 and continued until August 31, 2010 (the period was extended from August 16). Applicants were asked to specify the geographic delineation of the proposed HAPCs, the purposes and objectives, any proposed management measures for the site(s), and any effects that would be expected from such measures. Council staff initially screened the proposals that were received to determine consistency with the Council’s habitat priority type, compliance with the Council’s HAPC criteria, and for general adequacy and completeness.

At their fall 2010 meeting, the Joint Groundfish Plan Teams reviewed the HAPC proposals for rarity and for ecological merit. The Plan Teams’ recommendations are incorporated by reference in this analysis and within a matrix based on the Council’s revised and adopted HAPC evaluation criteria. (See Appendix A for details on the HAPC evaluation methodology.) At the October 2010 meeting, staff presented the preliminary report of screening results to the AP and the Council. The Council selected the HAPC proposal from the Alaska Fisheries Science Center (AFSC) to forward on for further analysis. At the February 2011 Council meeting, staff presented a discussion paper on the AFSC’s HAPC proposal package to the SSC, the AP, the Ecosystem and the Enforcement Committees, and to the Council. The

<sup>8</sup> “Skate nursery” sites are termed “skate egg concentration” areas for purposes of this analysis as per the Council’s motion from February 2011.

Council selected three alternatives and five options for conservation and management to forward on for full analysis.

### 2.3 Current HAPC Process Timeline

At its February 2012 meeting, the Council moved to expand the analysis and current suite of alternatives and options. The analysis was also reviewed by the Ecosystem and Enforcement Committees. Under the Council’s motion, Alternative 2 now includes a discussion on potential industry and agency monitoring, reporting, and accountability mechanisms, and a statement of intent to discourage adverse fishing activities within the HAPC sites. Alternative 3 is revised to include HAPC area boundaries consistent with the Enforcement Committee’s recommendations. Option e is reworded to suggest adding research and monitoring of areas of skate egg concentration to the Council’s annual research priority list. The expanded analysis also includes a lengthier history of fishing activities in the proposed sites, discussion on the ability to minimize the areas closed to fishing while complying with enforcement requirements, an economic analysis of impacts on the proposed closure sites, including buffers, and the amount of actual bycatch of egg casings by gear type in each HAPC site, where known. This analysis also incorporates recommendations and comments to the extent practicable from the SSC and Ecosystem and Enforcement Committees.

At this meeting, the Council may wish to select its preferred preliminary alternative (PPA) and preferred conservation and management options, identifying any of the six proposed areas of skate egg concentration as HAPCs and selecting any combination of gear prohibitions within an identified HAPC. The Council may also wish to designate research and monitoring of any areas of skate egg concentration as a research priority, to be added to its annual research priorities. Finally, the Council may wish to approve the consolidation of figures and tables that describe areas in Amendment 89 to the BSAI Groundfish FMP.

A schedule outlining the steps involved in the current HAPC proposal cycle is provided below:

**Table 7. The 2010 to 2012 HAPC proposal cycle**

<b>Steps in the HAPC process</b>	<b>Timeline</b>
Council identifies and sets HAPC priorities; criteria tables adopted.	April 2010
FR Notice of Request For Proposals (RFP); period to submit opens and closes.	April 26 – August 31 (18 weeks)
Council staff initial screening for adherence to priorities and completeness	September 2010
Plan Teams initial review for ecological merit	September 2010
Council review and decision on proposals to forward for further review	October 2010
Council staff review of proposals for socioeconomic considerations	October 2010 – January 2011
Ecosystem and Enforcement Committees conduct review and provide comments	February 2011
Council decision to formulate proposals into an amendment analysis	February 2011
Analysis	March 2011 – January 2012
Ecosystem and Enforcement Committees conduct review and provide comments	February 2012
First Initial Review of analysis	February 2012
<i>Second Initial Review of analysis</i>	<i>April 2012 (*)</i>
Final Action on FMP amendment analysis	June 2012 (T)

(\*) = The Council is currently at this step of the HAPC proposal cycle.

(T) = Tentatively scheduled.

### **2.3.1 Revisions to HAPC Cycle Timing**

At its June 2009 meeting, the Council considered whether to set priorities for identifying HAPCs and re-solicit for HAPC proposals. The Council opted to postpone its decision pending the completion of the EFH five-year review. The Council chose to synchronize the timing of the two actions so that results from the EFH five-year review could be considered in setting HAPC priorities and for the proposal cycle that might result. At the April 2009 Council meeting, the SSC recommended that the Council consider permanently changing the timeline to align HAPC cycles with the EFH five-year review. The Council added an amendment to revise the HAPC cycle timeline to the EFH Omnibus Amendment package, adopted by the Council at its April 2011 meeting. Though the HAPC process is now scheduled to occur every five years to coincide with EFH five-year reviews, the Council is not precluded from designating HAPC priorities out of cycle when appropriate; a HAPC cycle may be initiated at any time by the Council.

## **2.4 Summary of Proposed HAPCs**

Six areas of skate egg concentration in the BSAI management area have been proposed for designation as HAPCs. These six sites have been identified by NMFS scientists. The localized nature of these skate egg concentration areas makes them ideal for spatial management: they are very small areas, are static, and have distinct boundaries. Skates are elasmobranch fishes that reproduce by depositing a small number of large eggs protected by proteinaceous egg cases directly on the sea floor in localized areas of skate egg concentration. Skate embryos develop inside these cases, a process that can take over three years. During this development period, egg cases provide crucial protection to the fragile embryo and yolk mass. In the eastern Bering Sea, skate species deposit their eggs in highly localized areas known as “nursery sites,” (see Section 2.5.3 on nursery nomenclature) or as areas of skate egg concentration (see Appendix B – Color Figures 39 and 41 – 45). Skate populations are characterized by low fecundity and slow growth rates, suggesting a bottleneck during early life history stages. As such, areas supporting large numbers of egg cases are important and warrant special consideration. This is especially true because there is evidence of extended skate embryonic development (greater than three years) and vulnerability of egg cases to removal or disturbance by bottom-contact fishing activity.

Because skates are long-lived, slow to mature, and produce few offspring, it may be prudent to reduce or eliminate the potential for damage to these areas of skate egg concentration. The primary protection measures proposed by the AFSC authors for conservation and management are to prohibit the use of any fishing gear that makes contact with the sea floor within each area of skate egg concentration and to remotely monitor those areas. Providing some protection for the six areas proposed is intended to reduce the mortality of skate eggs due to fishing activity and to limit the disruption to adult skate reproduction.

Six areas of skate egg concentration in the eastern Bering Sea are proposed as HAPCs (see Appendix B – Color Figures 3-8 and 41-46). Each site has been studied and mapped using research bottom trawls to determine the density of egg cases, the extent of the area of skate egg concentration, mortality sources to young skates, and distinguishing abiotic features of the site that may define EFH. The exception is the Pribilof site, which was mapped using an autonomous underwater vehicle (AUV) equipped with a high-resolution camera. Additional AUV mapping work has been performed at several of the other sites listed, but those data were not used to delineate the original boundaries of the proposed sites. At each site, the spatial extent of bottom trawls containing less than 1,000 egg cases per km<sup>2</sup> was established.

Under Alternative 2, the boundary lines are snapped to the nearest minute of latitude or longitude away from the center of the area of skate egg concentration (Appendix B – Color Figure 40). This snapping creates a slight buffer region to account for the possibility of additional eggs in un-sampled areas. Using whole minutes also allows for a simpler boundary line that is easier to discern by vessels and

policymakers. See Appendix B – Color Figures 41-46. Under Alternative 2, the six proposed HAPC areas constitute a total of 81.7 nm<sup>2</sup>.

Under Alternative 3, each proposed HAPC meets a minimum size threshold of at least 5 nm to a side and, where appropriate, includes a buffer of 1 nm beyond the boundary of the core area to be protected. This minimum size is necessary for effective VMS tracking for enforcement, in order to account for current VMS capabilities, potential GPS error, and the dislocation between vessels and deployed gear. The threshold-sized boundaries are then snapped outward to the nearest minute of latitude and longitude. See Appendix B – Color Figures 3-8. Under Alternative 3, the six proposed HAPC areas constitute a total of 225.8 nm<sup>2</sup>.

The proportion of skate egg cases protected by the proposed HAPC areas is estimated to be between 10% and 20% for the Alaska skate, and potentially larger for the Aleutian and Bering skates due to their lower population size. The tables below contain information regarding each site including the bounding latitude and longitude lines and the area contained within the proposed boundaries. The figure below shows the locations of the six areas in the eastern Bering Sea, at the heads of several major and minor undersea marine canyons, located in the upper low slope areas (generally from 145 to 380 m).

**Alternative 2:**

**Table 8. The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 2.**

Site name <sup>a</sup>	Predominant skate species	Depth of max. egg density (m)	Maximum egg density (eggs/km <sup>2</sup> )	Area of HAPC nm <sup>2</sup>	Boundaries of HAPC (°N latitude or °W longitude)			
					North	South	West	East
1. Bering 1	Alaska	145	800,406	18.4	54°53'	54°49'	165°46'	165°38'
2. Bering 2	Aleutian	380	62,992	17.5	54°38'	54°33'	165°45'	165°34'
3. Bristol	Bering	156	6,188	13.7	55°21'	55°17'	167°40'	167°34'
4. Pribilof	Alaska	205	16,473	1.2	56°11'	56°10'	168°28'	168°26'
5. Zhemchug	Alaska	217	610,064	3.2	56°57'	56°54'	173°23'	173°21'
6. Pervenets	Alaska, Bering, Aleutian	316	334,163	27.7	59°28'	59°22'	177°43'	177°34'
<b>Total area of the eastern Bering Sea proposed as HAPCs under Alternative 2 = 81.7 nm<sup>2</sup></b>								

<sup>a</sup> Counterintuitively, the Bering 2 site is south of the Bering 1 site. Sites 3 through 6 run south to north.

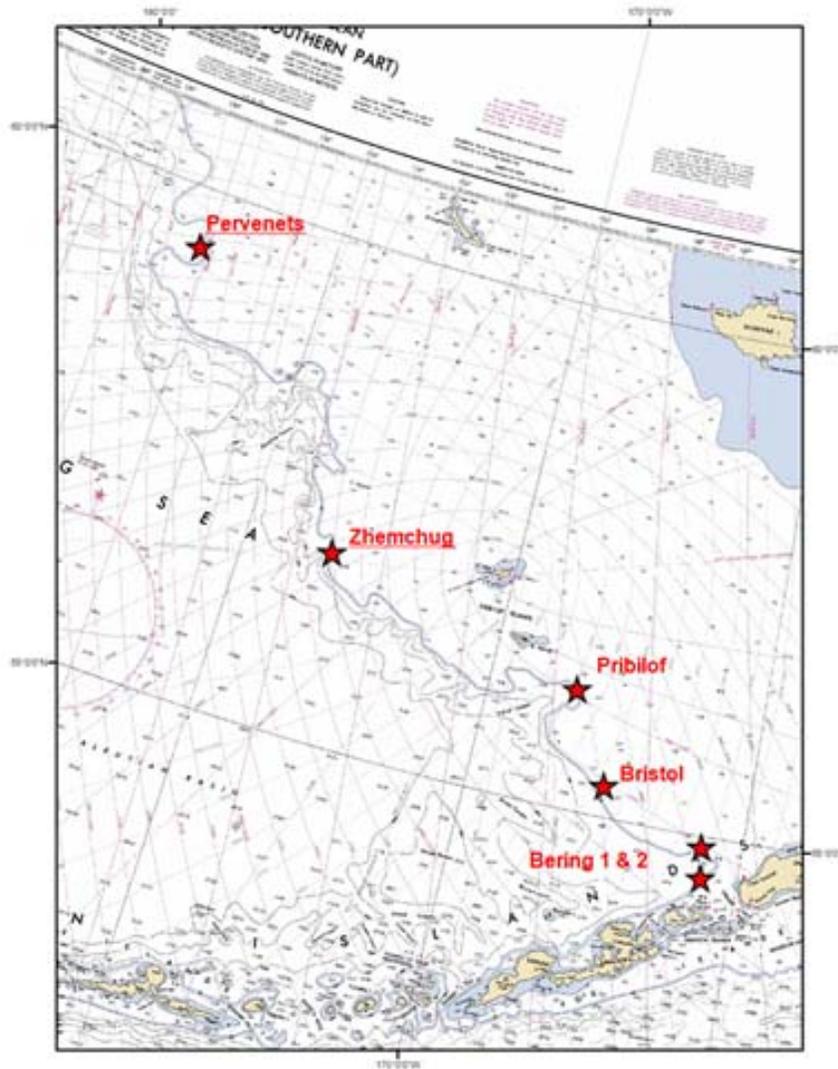
**Alternative 3:**

**Table 9. The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 3.**

Site name <sup>a</sup>	Predominant skate species	Depth of max. egg density (m)	Maximum egg density (eggs/km <sup>2</sup> )	Area of HAPC nm <sup>2</sup>	Boundaries of HAPC (°N latitude or °W longitude)			
					North	South	West	East
1. Bering 1	Alaska	145	800,406	41.8	54°54'	54°48'	165°48'	165°36'
2. Bering 2	Aleutian	380	62,992	40.9	54°39'	53°32'	165°47'	165°37'
3. Bristol	Bering	156	6,188	34.4	55°22'	55°16'	167°42'	167°32'
4. Pribilof	Alaska	205	16,473	28	56°13'	56°08'	168°32'	168°22'
5. Zhemchug	Alaska	217	610,064	27.4	56°58'	56°53'	173°27'	173°17'
6. Pervenets	Alaska, Bering, Aleutian	316	334,163	53.3	59°29'	59°21'	177°45'	177°36'

**Total area in the eastern Bering Sea proposed as HAPCs under Alternative 3 = 225.8 nm<sup>2</sup>**

<sup>a</sup> Counterintuitively, the Bering 2 site is south of the Bering 1 site. Sites 3 through 6 run south to north.



**Figure 2. Locations in the eastern Bering Sea of the proposed skate egg HAPCs (not to scale).**

### 2.4.1 Supporting Research

Much of the information used to support these six HAPCs candidate areas comes directly from the AFSC and years-long research effort by Dr. Gerald R. Hoff, an AFSC fishery biologist, to identify, map, and study areas of skate egg concentration in the eastern Bering Sea. Dr. Hoff's work has been supported through NOAA EFH funds and grants from the North Pacific Research Board. In addition, the Council requested that the AFSC produce a white paper summarizing scientific information on "skate nursery areas," or areas of skate egg concentration in the eastern Bering Sea (as well as the Pribilof, Pervenets, and Zhemchug Canyons in the eastern Bering Sea). The document produced was structured as an inventory of available data and applicable information as of fall 2006 and presented to the SSC, AP, and Council at the December 2006 meeting.

Because areas of skate egg concentration are rare and small in size, identifying these areas has been a major challenge for the AFSC. Data regarding trawl catches of egg cases from research surveys and fishery observers are used to identify potential sites. Dedicated research surveys for areas of skate egg concentration using a bottom trawl and an adaptive sampling design were conducted to map the spatial extent of seven areas of skate egg concentration and provide information regarding embryo size and viability, as well as egg case predation (Hoff 2010). Areas of skate egg concentration are small in area and highly localized, with abrupt transitions from areas of high egg case density to areas with little or no egg cases. They occur over a narrow depth range (from 150 to 375m) on generally flat sandy to muddy bottom, with little bottom structure or attached biota. Sites are associated with major undersea canyons and are generally located in the upper portion of canyon heads. These areas of skate egg concentration are highly productive, with some sites possessing estimated egg densities of more than 100,000 eggs/km<sup>2</sup>.

This work and earlier research (Hoff 2008) also identified the presence of multiple cohorts within areas of concentration and suggested that development time of Alaska skate embryos exceeded three years. This may be temperature dependent, a hypothesis supported by subsequent work where viable embryos were raised at different temperatures in the laboratory (Hoff *et al* 2010). This long development time substantially increases the exposure of the delicate embryos to predation and disturbance.

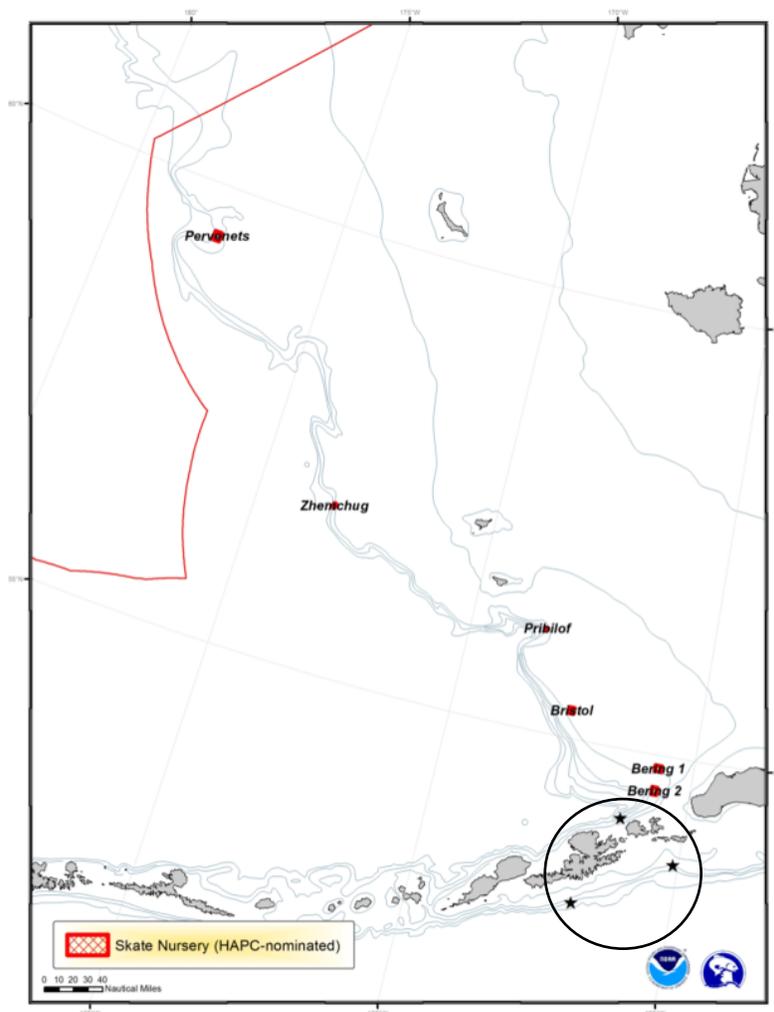
Skates, and elasmobranchs in general are considered low-productivity species, which results in part from delayed sexual maturity (e.g., 9 years for the Alaska skate; Matta and Gunderson 2007) and low fecundity (e.g., Ebert 2005). Thus skates are considered to be "equilibrium" life history strategists: they put a large amount of energy into a small number of offspring and rely on the high survival rate of offspring for maintaining the strength of populations. This may be compared to species such as Pacific cod that produce huge numbers of eggs, very few of which are likely to survive. This life history strategy underscores the importance of skate early life survival and reducing the potential for damage to embryos in areas of skate egg concentration.

The AUV surveys conducted in 2009 were also used to obtain estimates of egg production in the four then-known Alaska skate areas of egg concentration, which were then compared to estimates of egg and juvenile abundance from AFSC research surveys and stock assessments (Hoff 2010b). This work indicated that the known areas of skate egg concentration probably are not sufficient to sustain the population of Alaska skates and thus there are likely areas of skate egg concentration not identified.

## 2.5 Subsequent Developments

Estimates of egg and juvenile abundance from AFSC research surveys and stock assessments (Hoff 2010b) indicate that known areas of skate egg concentration are not likely sufficient to sustain the estimated total population of Alaska skates, which indicates that there are likely additional areas of skate

egg concentration not observed and identified. Recently, ASFC scientists have identified three new areas of skate egg concentration from recent research efforts (see figure below). Preliminarily, these sites appear to be of similar size (very small) and nature (distinct) to the known BSAI areas of skate egg concentration. Notably, two areas are identified south of the Aleutian Islands, in the Gulf of Alaska. Site specific research has not been conducted, and it is too early to determine the overall distribution of these sites based on egg case concentration.



**Figure 3. Locations of the three additional areas of skate egg concentration in the Gulf of Alaska.**  
Source: NMFS HCD.

An issue raised during this HAPC proposal was how to submit additional HAPC sites that meet existing HAPC priorities. In response to concerns that there may be other skate egg concentration sites in Alaskan waters, the Council determined that additional sites would NOT be included within the 2010-2012 HAPC cycle. The Council's consideration of sites to identify as HAPCs is limited to the six areas of skate egg concentration identified as potential HAPCs by the AFSC's proposal, at the time the proposal was submitted in August 2010. Though the proposers anticipate identification of additional areas of skate egg concentration and would propose similar protections for those sites, any new sites would need to be considered during a separate HAPC cycle. The Council may wish to periodically review the efficacy of HAPC priorities and allow for input, such as new scientific research for priority areas.

### **2.5.1 Council Policy Statement for Future Areas**

At the February 2011 Council Meeting, the Ecosystem Committee recommended that the Council specifically address the broader HAPC policy question of whether Council HAPC priorities are, by default, continuing priorities for which HAPC site proposals may be submitted on a continuing basis, or whether a Council HAPC priority exists exclusively for the duration of a Council HAPC proposal cycle. In the latter case, no further HAPC proposals would be accepted for a given HAPC priority after the conclusion of the HAPC proposal cycle unless the Council re-designates that particular HAPC priority and initiates another HAPC proposal cycle or NMFS brings forward compelling information to suggest that the Council should re-designate the HAPC priority. At its April 2011 meeting, the Council adopted the following policy statement to clarify the timing and duration of HAPC cycles through Final Action on the EFH Omnibus Amendment package (Section 9.1.1):

In conjunction with the EFH five-year review and resulting EFH Omnibus Amendment package, the Council identified ambiguity in its HAPC process with respect to whether Council HAPC priorities are considered to be valid in perpetuity, or whether they are specific to a particular HAPC cycle and expire at the conclusion of a particular call for proposals and subsequent Council action.

At the February 2011 Council meeting, the Council considered this ambiguity and made a policy statement with respect to how the Council's HAPC process should be interpreted. The Council indicated that a HAPC priority exists exclusively for the duration of a Council HAPC proposal cycle. Thus, HAPC site proposals for a previously-designated HAPC priority may not be submitted on a continuing basis. No HAPC proposals responding to a given HAPC priority need be accepted after the conclusion of the HAPC proposal cycle unless the Council re-designates that particular HAPC priority and initiates another HAPC proposal cycle or NMFS brings forward compelling information to suggest the Council should re-designate the HAPC priority.

During the development of the Council's HAPC process (as outlined in the 2005 EFH EIS), it was understood that there would be two primary avenues for alerting the Council to habitat priorities that may need consideration as HAPCs. The first is the Council's periodic consideration of habitat priorities, at which time staff, the Plan Teams, or members of the public may bring up habitat issues for Council consideration. Under the current program, this periodic review will occur every five years, changed from every three by the EFH Omnibus Amendment package so that the gathering of information for the five-year EFH review can provide the basis of the Council's HAPC consideration.

Also during development of the HAPC process, it was understood that NMFS would be reviewing habitat information on a continuous basis. When warranted, NMFS may bring proposed habitat concerns or suggested HAPC priorities to the Council and the Council may choose to take action. The HAPC process language in the FMPs that remains unchanged under the EFH Omnibus Amendments allows the Council to initiate a HAPC process and solicit HAPC proposals on a schedule established by the Council.

### **2.5.2 Number of Expected Areas of Egg Concentration**

The eastern Bering Sea skate population occurs at mid-slope depths with the bulk of its population occurring from about 100 to 500 m. It also has a moderate population estimate from trawl surveys. Since it appears as a mid-depth species, it is most likely that it is under-sampled on the eastern Bering Sea shelf from the trawl survey. A large percentage (22.7%) of the Bering skate biomass encountered during the

eastern Bering Sea shelf survey occurs between 150 m and 200 m. Since the shelf survey is of fixed station design its annual distribution of effort is about two percent of the deepest 50 m (approximately 10 stations annually) with only about 0.07% of the effort between 175 m and 200 m depth (less than one station annually) of a nearly 400 station survey. It is likely a large portion of the population is under-sampled where it is in highest density.

It is helpful in the current HAPC cycle to produce a reasonable estimate of the expected number of sites in the eastern Bering Sea used by skates for depositing their eggs. Ecologically, this information can help scientists understand how skates partition and use their habitat and what environmental parameters may be the most critical for successful reproduction. Biologically, areas of skate egg concentration shed new light on skate reproduction and what role these areas may play in skate life history strategies. Economically the number, location, and area used for skate egg deposition is useful as a gauge for the impact it could have on fishing activity and enforcement challenges for gear restrictions.

To estimate the expected number of areas of skate egg concentration of these three skate species in the eastern Bering Sea, a synthesis of directed studies on areas of skate egg concentration, as well as results of the eastern Bering Sea shelf and upper continental slope groundfish bottom trawl surveys, are used. The following analysis compared the estimated number of viable skate eggs from a single cohort in all known areas of skate egg concentration combined for a single species to the estimated young-of-the-year (YOY) skates from the eastern Bering Sea shelf and slope trawl surveys. When YOY exceeded the total single cohort viable egg counts, an estimate of the number of average areas of skate egg concentration that could meet the production estimate was calculated:

**Equation 1. Estimated number of areas of skate egg concentration in the eastern Bering Sea.**

Single Cohort Viable Eggs = (Total Area of skate egg concentration (km <sup>2</sup> ) × Mean Egg Density (eggs/km <sup>2</sup> ) / 3) × 0.8
Number of Expected Sites = Young-of-the-Year / Single Cohort Viable Eggs × Known Number of Sites
The total eggs are divided by 3 to estimate a single cohort when 3 cohorts are present at each site and 0.8 is the viable portion of the egg population accounting for empty discarded eggs.

The results suggest approximately one half of the areas of skate egg concentration for the Alaska, Bering, and Aleutian skates combined are known – eight – with an expected total of sixteen sites for these three species: one would expect at least two additional sites for the Alaska skate, zero or one additional for the Bering skate, and an additional six for the Aleutian skate. The species-specific populations, distributions, and reproductive dynamics all play significant roles in determining how many areas of skate egg concentration a species may use.

**Table 10. Egg estimates for each area of concentration and the annual cohort estimate comparing areas of concentration to trawl survey estimates (YOY=young-of-the-year)**

Nursery	Total nursery area (km <sup>2</sup> )	Egg density (mean km <sup>2</sup> )	Total eggs	Viable eggs (single cohort)	Number of identified sites	YOY survey estimate	Juvenile length range	Number of sites expected for YOY
<b>Alaska skate</b>								
Pervenets Canyon	37	67,124	2,483,313	662,217	1			
Zhemchug Canyon	102	42,066	4,279,687	1,141,250	1			
*Pribilof Canyon	1	18	174,811	46,616	1			
Bristol Canyon	56	65	3,656	975				
Bering Canyon	38	43,496	1,671,775	445,807	1			
<b>Totals</b>	<b>234</b>	<b>30,554</b>	<b>8,613,243</b>	<b>2,296,865</b>	<b>4</b>	<b>3,552,698</b>	<b>21-27 cm</b>	<b>6</b>
<b>Bering skate</b>								
Pervenets Canyon	71	14,616	1,034,895	275,972	1			
Zhemchug Canyon	7	1,411	9,760	2,603				
Bristol Canyon	9	7,198	62,682	16,715	1			
Bering Canyon	13	835	10,585	2,823				
<b>Totals</b>	<b>99</b>	<b>6,015</b>	<b>1,117,923</b>	<b>304,361</b>	<b>2</b>	<b>286,204</b>	<b>16-20 cm</b>	<b>2</b>
<b>Aleutian skate</b>								
Pervenets Canyon	12	17,015	204,294	54,478	1			
Zhemchug Canyon	102	12	1,194	319				
Bristol Canyon	9	445	3,876	1,034				
Bering Canyon	30	14,616	334,201	89,120	1			
<b>Totals</b>	<b>152</b>	<b>8,022</b>	<b>543,566</b>	<b>144,951</b>	<b>2</b>	<b>605,164</b>	<b>22-27 cm</b>	<b>8</b>

\*Based on AUV study

The Bering skate deposits its eggs at low densities in many sites other than its own. The extrapolations indicate the number of sites known can account for the juvenile production estimates from the trawl surveys. However, it is expected that a significant portion of this species population is not surveyed well on the shelf because of the sparse sampling in its primary habitat. It is likely there are many more YOY for the Bering skate and that an additional area of skate egg concentration is probable.

The Aleutian skate is a very abundant species along the slope; however, at its known areas of skate egg concentration are not found at high densities and the species has high fidelity to its own areas of skate egg concentration, suggesting it does not widely scatter its eggs at other sites. This results in a higher than expected number of sites given the species population and one of the highest estimated (again, eight sites).

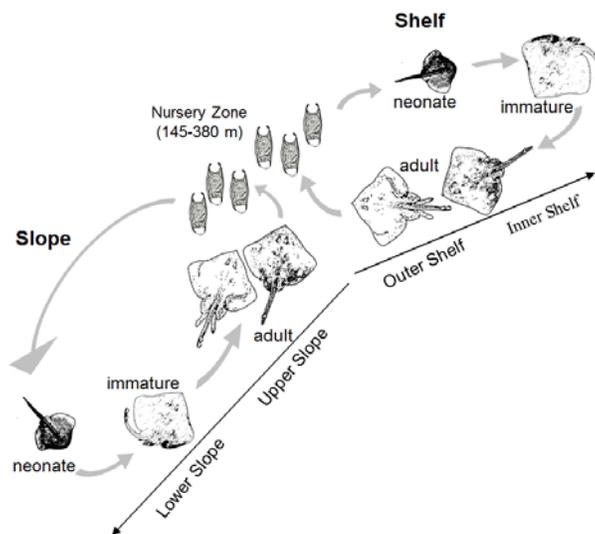
**Table 11. Estimation of areas of skate egg concentration by species based on egg densities and young of the year estimates from bottom trawl surveys.**

Skate species	Density eggs (km <sup>2</sup> )	Total area (km <sup>2</sup> )	Total eggs	YOY survey estimate	Total population estimate	Expected sites
Alaska	30,554	234	8,613,243	3,552,698	119,152,780	6
Bering	6,015	99	1,117,923	286,204	12,629,198	2
Aleutian	6,722	144	357,392	605,164	7,090,172	8

### 2.5.3 Areas of Skate Egg Concentration Nomenclature

The concept of North Pacific skates using “nursery sites” for egg deposition is not a new one; the terminology of “nursery sites” has traditionally been applied to oviparous species. As with much terminology for skates and rays, the terms currently used were originally determined for sharks, which have been studied in much more detail. Many sharks utilize the classic example of nursery sites where a pregnant female migrates to a particular bay or nearshore area and gives birth to live young. The young sharks then remain in the “nursery” for some period until able to survive in open water. In this case, the area for young to remain for a period where they may need extra nutrients or protection is the well-expected idea of a nursery area. This terminology has been applied to areas where skates deposit their egg cases in mass; there are fundamental differences, however, in the reproductive strategy of oviparous skates and most viviparous sharks.

Primarily skates (Rajidae) in the North eastern Pacific deposit eggs directly on the substrate and the embryo develops independent of maternal nutrients or care other than what was initially given. Many sharks and true rays (Mylobatidae) have some form of viviparity in which the egg cases and embryos are retained in the female body and provided nutrients by the mother until fully developed and produced into the environment as free swimming juveniles. Sharks and true rays do not go through the extended period in the egg case before hatching, as skates do:



**Figure 4. Life cycle with respect to habitat use for skates along the slope (200 to 1200 m) and the shelf (0 to 200 m) in the eastern Bering Sea.**

Research since 2003 on skate reproduction has found that “nursery sites” may not be the optimal terminology for how skates utilize the habitat. Other terminology follows the concept of “skate nesting sites.” Functionally, they operate much like marine turtles in which their reproductive habitat and mode is widely accepted as “nesting sites.” To understand how skates utilize the habitat, one can simply apply all the mechanics and strategies that turtles use. At a designated time of year, both turtles and skates migrate to a predetermined habitat and specific location (possibly where they were hatched) and the females deposit eggs in mass. The females then depart the nesting site, provide no additional parental care, and most likely never again encounter the young throughout the parents’ life.

After egg deposition, internally the skate egg looks identical to birds and many reptiles. There is a large yolk mass surrounded by a cushion of clear to white albumin like substance (superficially equivalent to the white of a chicken egg). For North Pacific skates, there is no appreciable development before egg deposition and the skate develops entirely on the reserves of the yolk provided during the initial egg production similar to all birds and reptiles. Embryo development progresses with external integuments and internal organ development until finally full development results in a chick, or juvenile skate or reptile, emerging from the egg casing. All these stages are remarkably similar in vertebrates and all standard terminology and stages are applicable.

After a prolonged development, juveniles emerge in mass and quickly exit the nesting site, avoiding being consumed by waiting predators. The young are fully mobile and able to feed upon hatching. In both cases (skates and turtles), the area of egg deposition is not where the newly hatched juveniles occur. In the eastern Bering Sea, the juveniles move either much deeper or much shallower (depending on the species) specifically avoiding the areas of skate egg concentration. Technically the area of egg concentration for skates would be far from the area of skate egg deposition and for most species in the eastern Bering Sea would be much deeper along the slope. This makes for a strong argument to change the nomenclature for skates to much more accurately describe their reproductive strategy, however until the new terminology is vetted, the term “areas of skate egg concentration” is used in this analysis.

The term “skate nursery” is the scientific term for areas where skates deposit their egg cases in mass for the purpose of reproduction. The terminology was originated for viviparous sharks which gave birth to live young in distinct nearshore habitats where the young would spend their early life. The term nursery, when applied to this behavior, has been well vetted and is the most appropriate for this reproductive mode. As with many scientific concepts and terminology, skates life history was detailed following sharks and many of the established terms were applied to skates that were previously established for sharks since the two are closely related. The scientific field of understanding skate nursery habitat and biology is in its infancy with fewer than five publications on the subject outside those of the eastern Bering Sea. Although little work has been done in this field worldwide areas where skates deposit their egg cases for reproduction are known as skate nurseries.

Those identified as potential HAPC areas in the eastern Bering Sea are clearly distinct habitats with unique properties that are advantageous for successful reproduction in skates. Developing an additional term (i.e. “areas of skate egg case concentrations”) could produce unnecessary confusion and complexity to this issue. Introducing a generic, un-vetted term for these sites could mislead the public by establishing that these areas are not recognized as skate nursery sites as understood by the scientific community and are something other than what has been established. As skate nursery sites are recognized in other major marine habitats worldwide and conservation methods are established as necessary, the accepted, well vetted term “skate nursery” could more appropriately be applied. This would be an unfortunate state for Alaskan waters where they were the first in the world to recognize these as important habitats, yet the unconventional terminology makes them less recognizable and perhaps an overlooked precedent simply because of the names applied to these sites. Using the term of “skate nursery” is the most appropriate.

Nonetheless, per the Council’s motion at its February 2011 meeting, these “skate nursery” sites will be referred to throughout this analysis as “areas of skate egg concentration.”

### **3.0 ENVIRONMENTAL ASSESSMENT (EA)**

The purpose of this section is to analyze the environmental impacts of the proposed Federal action to designate six areas of skate egg concentration as HAPCs. An environmental assessment (EA) is intended to provide evidence of whether or not the environmental impacts of the action are expected to be significant (40 CFR 1508.9).

An EA must consider whether an action will have a significant effect on the quality of the human environment (40 CFR 1508.27; NAO 216-6, 6.01b). Significance is determined by considering the contexts (geographic, temporal, and societal) in which the action will occur, and the intensity of the effects of the action. The evaluation of intensity should include consideration of the magnitude of the impact, the degree of certainty in the evaluation, the cumulative impact when the action is related to other actions, the degree of controversy, and consistency with other laws. If an impact is not considered significant, a Finding of No Significant Impact (FONSI) is issued. (See Section 6.0.)

The proposed action is limited the eastern Bering Sea and, depending on the alternative selected, the intent is to discourage or prohibit fishing activities that make contact with the sea floor. Effects of this action that are analyzed are therefore limited to the locations of the six sites proposed as a HAPC and to any component of the environment that may be impacted by fishing prohibitions under Options a-d.

#### **3.1 Relevant NEPA Documents**

The NEPA documents listed below have detailed information on the BSAI groundfish fisheries, and on the natural resources and the economic and social activities and communities affected by those fisheries. These documents contain valuable background for the actions under consideration in this EA/RIR/IRFA. The Council on Environmental Quality (CEQ) regulations encourage agencies preparing NEPA documents to incorporate by reference the general discussion from a broader EIS and concentrate solely on the issues specific to the environmental assessment subsequently prepared. According to the CEQ regulations, whenever a broader EIS has been prepared and a NEPA analysis is then prepared on an action included within the entire program or policy, the subsequent analysis shall concentrate on the issues specific to the subsequent action. The subsequent EA need only summarize the issues discussed and incorporate discussions in the broader EIS by reference (see 40 CFR 1502.20).

##### **3.1.1 Alaska Groundfish Programmatic Supplemental Environmental Impact Statement EIS (PSEIS)**

In June 2004, NMFS completed the PSEIS that disclosed the impacts from alternative groundfish fishery management programs on the human environment (NMFS 2004). The following provides information on the relationship between this EA/RIR/IRFA and the PSEIS. NMFS issued a Record of Decision on August 26, 2004, with the simultaneous approval of Amendment 74 and Amendment 81 to the FMP to implement the preferred alternative in the PSEIS, respectively. This decision implemented a policy for the groundfish fisheries management programs that is ecosystem-based and is more precautionary when faced with scientific uncertainty. During staff tasking at its February 2012 meeting, the Council discussed the schedule for review of the groundfish PSEIS and will receive a report back from NMFS staff at its April 2012 meeting. Until the current PSEI is reviewed, revised, and adopted, the 2004 PSEIS remains the relevant evaluation of alternative groundfish fishery management programs on the human environment.

The PSEIS brings the decision maker and the public up to date on the current state of the human environment, while describing the potential environmental, social, and economic consequences of alternative policy approaches and the corresponding management regimes for management of the groundfish fisheries off Alaska. In doing so, it serves as the overarching analytical framework that will be

used to define future management policy with a range of potential management actions. Future amendments and actions will logically derive from the chosen policy direction set for the PSEIS' preferred alternative.

As stated in the PSEIS, any specific FMP amendments or regulatory actions proposed in the future will be evaluated by subsequent EAs or EISs that incorporate by reference information from the PSEIS but stand as case-specific NEPA documents and offer more detailed analyses of the specific proposed actions. As a comprehensive foundation for management of the GOA and BSAI groundfish fisheries, the PSEIS functions as a baseline analysis for evaluating subsequent management actions and for incorporation by reference into subsequent EA/EISs that focus on specific Federal actions.

### **3.1.2 Alaska Groundfish Harvest Specifications Environmental Impact Statement**

In January 2007, NMFS completed the EIS analyzing the impacts of various harvest strategies for the Alaska groundfish fisheries. Except for the no action alternative, the alternatives analyzed would implement the preferred management strategy contained in the PSEIS. This document contains an analysis of the effects of the alternative harvest strategies on target groundfish species, non-target species, prohibited species, marine mammals, seabirds, habitat, ecosystem relationships and social and economic concerns. The analysis is based on the latest information regarding the status of each of these environmental components and provides the most recent consideration of reasonably foreseeable future actions to consider in the cumulative effects analysis. The EIS provides the latest overall analysis of the impacts of the groundfish fisheries on the environment and will provide a substantial amount of reference material for the purposes of this EA/RIR/IRFA.

### **3.1.3 BSAI Final 2011-2012 Harvest Specifications Environmental Assessment**

Final Harvest specifications for BSAI groundfish fisheries for 2011 and 2012 were analyzed in an environmental assessment to determine significance of the potential effects of alternative harvest strategies. This EA/IRFA provided recent, applicable methods of determining significance of effects on marine mammals and seabirds. These criteria are used in this Bering Sea Habitat Conservation analysis because they apply the latest understanding of the potential effects of groundfish fisheries on marine mammals and seabirds to determine the significance of an effect. This EA will analyze alternatives to further conserve fish habitat in the eastern Bering Sea. This proposed action derives from the policy established in the preferred alternatives in the PSEIS and in the EFH EIS.

### **3.1.4 Essential Fish Habitat Environmental Impact Statement**

In 2010, NMFS and the Council conducted an EFH five-year review. The review examined information within the 2005 EFH EIS and determined: 1) new and more recent information exists to refine EFH for a small subset of managed species; 2) certain fishing effects may be impacting sensitive habitats of Bristol Bay red king crab; however additional analysis is needed; and 3) the non-fishing impacts analysis, including advisory EFH Conservation Recommendations, should be updated with the most current level of information. The Council has revised the EFH sections of its FMPs to address the results of the five-year review through the EFH Omnibus Amendment package adopted in April 2011.

In 2005, NMFS and the Council completed the EIS for Essential Fish Habitat Identification and Conservation in Alaska. The EFH EIS provided a thorough analysis of alternatives and environmental consequences for amending the Council's FMPs to include EFH information pursuant to Section 303(a)(7) of the Magnuson-Stevens Act and 50 CFR 600.815(a). Specifically, the EFH EIS examined

three actions: 1) describing and identifying EFH for Council managed fisheries; 2) adopting an approach to identify HAPCs within EFH; and 3) minimizing to the extent practicable the adverse effects of fishing on EFH. The Council's preferred alternatives from the EFH EIS are implemented through Amendments 78/65 and 73/65 to the GOA and BSAI groundfish FMPs, respectively, Amendments 16 and 12 to the FMP for BSAI King and Tanner Crab, Amendments 9 and 7 to the FMP for the Scallop Fishery off Alaska, and Amendments 7 and 8 to the FMP for Salmon Fisheries in the Exclusive Economic Zone (EEZ) off the Coast of Alaska. A Record of Decision was issued on August 8, 2005. NMFS approved the amendments on May 3, 2006. Regulations implementing the EFH/HAPC protection measures were effective July 28, 2006 (71 FR 36694, June 28, 2006).

## **3.2 Purpose and Need for the Action**

The purpose of this action designating areas of skate egg concentration as HAPCs is to address the protection of eggs and developing embryos of skate species in the eastern Bering Sea. Skate eggs are deposited in small, highly localized areas. Eggs and embryos are protected by proteinaceous egg cases; however the egg cases, eggs, and embryos are susceptible to damage or destruction from fishing gear that makes contact with the sea floor. In addition, fishing activity may be disruptive to reproductive adult skates depositing eggs in these localized areas. Because skates have relatively low productivity (i.e., low fecundity, long embryo development times, and delayed adult maturity), a need exists to protect areas of skate egg concentration and limit the potential loss of skates in its early life stages.

### **3.2.1 Statement of Purpose and Need**

The Council adopted the following Statement of purpose and need at its February 2011 meeting:

*HAPCs are geographic sites that fall within the distribution of Essential Fish Habitat for the Council's managed species. The Council has a formalized process, identified in its FMPs, for selecting HAPCs that begins with the Council identifying habitat priorities—here, areas of skate egg concentration. Candidate HAPCs must be responsive to the Council priority, must be rare (defined as uncommon habitat that occurs in discrete areas within only one or two Alaska regions), and must meet one of three other considerations: provide an important ecological function; be sensitive to human-induced degradation; or be stressed by development activities.*

*The candidate HAPCs identify sites of egg concentration by skate species (Rajidae) in the eastern Bering Sea. Skates are elasmobranch fish that are long-lived, slow to mature, and produce few young. Skates deposit egg cases in soft substrates on the sea floor in small, distinct sites. A reproducing skate deposits only several egg cases during each reproductive season. Depending on the species, a single egg case can hold from one to four individual skate embryos, and development can take up to three years. Thus, a single egg case site will hold several year classes and species, and eggs growing at different rates.*

*Distinct skate egg deposition sites have been highlighted by skate stock experts while assessing skate information from research survey and catch locations. The scientists noted repeated findings of distinct sites where egg cases recruit to sampling or fishing gear contacting the sea floor: egg case prongs (or horns) entangle in or cases recruits into the gear. The eggs and embryos are highly susceptible during their lengthy development to disturbance, damage, or destruction from fishing gear that contacts the sea floor. Fishing activities within these sites can also disrupt recently hatched juveniles and reproductive adult skates depositing new eggs in these sites. It is therefore important to protect areas of skate egg concentration and limit the loss of skates during its early life stages.*

This EA/RIR/IRFA evaluates the impacts of three alternatives, which include a no action alternative, four gear use restriction options, and an option for research and monitoring. The alternatives and options are not mutually exclusive to the six proposed HAPCs, and any combination may be selected for each area proposed: the options may be chosen in any combination with the alternatives.

### **3.3 Action Alternatives and Options**

In order to address the issues described in its statement of purpose and need, the Council identified three alternatives and five options for analysis, shown below. In addition, an FMP housekeeping option has been added to the analysis (Option f).

#### **Alternative 1: Status quo; no action.**

No measures would be taken to identify, or to identify and conserve, areas of skate egg concentration as HAPCs.

#### **Alternative 2: Identify skate egg concentration HAPC(s).**

The Council may select to identify – individually, severally, or all six of – the areas of skate egg concentration as HAPCs.<sup>9</sup> The intent of Alternative 2 is to “discourage fishing in these areas” of skate egg concentration with gear that makes contact with the sea floor.

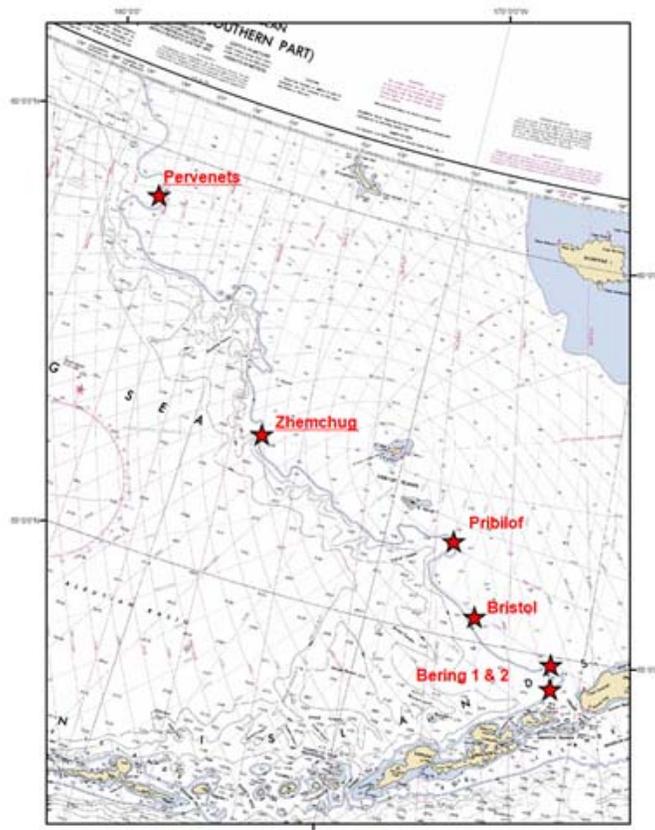
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<sup>9</sup> 50 C.F.R. 600.815(a)(8). Essential Fish Habitat (EFH) provisions provide a means by which the Council may identify HAPCs within FMPs.

**Table 12. The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 2.**

Site name <sup>a</sup>	Predominant skate species	Depth of max. egg density (m)	Maximum egg density (eggs/km <sup>2</sup> )	Area of HAPC nm <sup>2</sup>	Boundaries of HAPC (°N latitude or °W longitude)			
					North	South	West	East
1. Bering 1	Alaska	145	800,406	18.4	54°53'	54°49'	165°46'	165°38'
2. Bering 2	Aleutian	380	62,992	17.5	54°38'	54°33'	165°45'	165°34'
3. Bristol	Bering	156	6,188	13.7	55°21'	55°17'	167°40'	167°34'
4. Pribilof	Alaska	205	16,473	1.2	56°11'	56°10'	168°28'	168°26'
5. Zhemchug	Alaska	217	610,064	3.2	56°57'	56°54'	173°23'	173°21'
6. Pervenets	Alaska, Bering, Aleutian	316	334,163	27.7	59°28'	59°22'	177°43'	177°34'
<b>Total area of the eastern Bering Sea proposed as HAPCs under Alternative 2 = 81.7 nm<sup>2</sup></b>								

<sup>a</sup> Counterintuitively, the Bering 2 site is south of the Bering 1 site. Sites 3 through 6 run south to north.



**Figure 5. The locations in the eastern Bering Sea of the six skate egg concentration HAPCs (not to scale).**

At each of the six areas of skate egg concentration, the spatial extent of bottom trawls containing more than 1,000 egg cases per km<sup>2</sup> have been established. Boundary lines are then snapped outward to the nearest minute of latitude or longitude.

**Alternative 3: Identify and conserve skate egg concentration HAPC(s).**

The Council may select to identify – individually, severally, or all six of – the areas of skate egg

concentration as HAPCs – AND – the Council may select different conservation and management options for any area identified as a skate egg concentration HAPC:

**Option a: Prohibit within skate egg concentration HAPC(s) the use of “mobile bottom contact”<sup>10</sup> fishing gear: nonpelagic (i.e., bottom) trawl, dredge, and dinglebar gear.**

**Option b: Prohibit within skate egg concentration HAPC(s) the use of “mobile bottom contact” and pelagic trawl fishing gear: nonpelagic and pelagic trawl, dredge, and dinglebar gear.<sup>11</sup>**

**Option c: Prohibit within skate egg concentration HAPC(s) the use of “bottom contact”<sup>12</sup> fishing gear: nonpelagic trawl, dredge, dinglebar, pot, and hook and line (i.e., longline) gear.**

**Option d: Prohibit within skate egg HAPC(s) the use of all fishing gear: nonpelagic and pelagic trawl, dredge, dinglebar, pot, and hook and line gear.**

To achieve effective enforcement of these areas, Alternative 3 establishes a minimum size threshold for the core concentration areas to be protected of at least 5 nm to a side and are then, where appropriate, enlarged with a buffer of 1 nm beyond the original boundary under Alternative 2. Boundaries are then snapped outward to the nearest minute of latitude and longitude.

**Table 13. The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 3.**

Site name <sup>a</sup>	Predominant skate species	Depth of max. egg density (m)	Maximum egg density (eggs/km <sup>2</sup> )	Area of HAPC nm <sup>2</sup>	Boundaries of HAPC (°N latitude or °W longitude)			
					North	South	West	East
1. Bering 1	Alaska	145	800,406	41.8	54°54'	54°48'	165°48'	165°36'
2. Bering 2	Aleutian	380	62,992	40.9	54°39'	53°32'	165°47'	165°37'
3. Bristol	Bering	156	6,188	34.4	55°22'	55°16'	167°42'	167°32'
4. Pribilof	Alaska	205	16,473	28	56°13'	56°08'	168°32'	168°22'
5. Zhemchug	Alaska	217	610,064	27.4	56°58'	56°53'	173°27'	173°17'
6. Pervenets	Alaska, Bering, Aleutian	316	334,163	53.3	59°29'	59°21'	177°45'	177°36'
<b>Total area in the eastern Bering Sea proposed as HAPCs under Alternative 3 = 225.8 nm<sup>2</sup></b>								

<sup>a</sup> Counterintuitively, the Bering 2 site is south of the Bering 1 site. Sites 3 through 6 run south to north.

**Additional Options**

The following options are applicable to ALL of the alternatives, in any combination of skate egg concentration HAPCs, and with any combination of conservation and management measures the Council selects:

**Option e: Suggest adding research and monitoring of areas of skate egg concentration to the Council's research priority list.**

<sup>10</sup> 50 C.F.R. 679.2.

<sup>11</sup> See 50 C.F.R. 679.2 for the particular and intricate components defining “pelagic trawl” fishing gear.

<sup>12</sup> 50 C.F.R. 679.2.

The Council may suggest incorporating continued research and monitoring of skate species into the Council's annual research priority list, to evaluate skate populations, skate egg concentration areas, and their ecology and habitat.

**Option f: Adopt formatting standards as stated in the final rule implementing Amendment 89 to the BSAI Groundfish FMP.**

The Council may approve the consolidation of figures and tables that describe areas in Amendment 89 to the BSAI Groundfish FMP, which establishes Bering Sea habitat conservation measures. Color Figures 66-69 in Appendix B describe the Bering Sea Habitat Conservation Area, the Northern Bering Sea Research Area and Saint Lawrence Island Habitat Conservation Area (HCA), and the Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area, respectively.

### **3.4 Discussion of Alternatives and Options**

#### **3.4.1 Alternative 1**

Alternative 1, the status quo or no action alternative, involves no measures to identify areas of skate egg concentration as HAPCs or to protect and conserve those areas of skate egg concentration from adverse fishing effects.

#### **3.4.2 Alternative 2**

Alternative 2 would identify areas of skate egg concentration as HAPCs without any associated conservation measures. The Council may select individually, severally, or all of the six areas identified as potential skate egg concentration HAPCs. Under Alternative 2, the Council would not limit fishing activities or prohibit gear types that make contact with the sea floor. Alternative 2 is intended, however, to discourage fishing activities in these areas with any gear that makes contact with the sea floor.

At each site, the spatial extent of bottom trawls containing more than 1,000 egg cases/km<sup>2</sup> was established. Under Alternative 2, the boundary lines are then snapped to the nearest minute of latitude or longitude away from the center of the concentration area. This snapping creates a buffer region to account for the possibility of additional eggs in un-sampled areas. Using whole minutes also allows for a simpler boundary line that will be easier to discern by fishing vessels, regulators, and policymakers.

##### **3.4.2.1 Potential for Monitoring, Reporting, and Accountability**

This section discusses the potential for industry and agency (NMFS) monitoring, reporting, and accountability mechanisms under Alternative 2. The intent of establishing HAPCs is to highlight areas within EFH of particular ecological importance that are rare and subject to human-induced perturbations. HAPC identification does not, however, connote conservation. The specific intent of HAPC identification is to increase agency and public awareness of fish habitats and features ecologically important or sensitive to disturbance.

#### **Agency monitoring and reporting**

NMFS strives to provide information in such a manner as to affirm public awareness of HAPCs. NMFS contends a more informed public will then consider conservation of EFH when taking action or conducting activities within a designated HAPC.

In the Alaska Region, vessel monitoring systems (VMS) provide NMFS with vessel location data for enforcement and management applications. Existing reporting and records management are adequate to account for occurring fishing activities and to create a record of activities and harvests in a particular fishery. In general, agency monitoring must be aligned with specific recommendations to address regulatory authorities or conservation strategies. Regulatory monitoring must satisfy legal challenges when any specific regulation is not adhered to. Conservation monitoring must account for the condition to be conserved (i.e., expected to be affected) as compared to the same condition not being conserved.

Though NMFS has not conducted an overall, robust review on the efficacy of existing HAPC management measures, it would be expected that little, if any, enforceable actions have actually been taken in any existing HAPCs to address fishing activities that violate conservation prohibitions. This may be because EFH analysts have not been able to readily identify enforcement actions specific to HAPC regulation or because the fishing industry has accepted and adhered to HAPC conservation measures. In regards to the information available to EFH analysts, violations may not be readily known because ongoing investigations and enforceable actions may be protected by privacy clauses. Essentially, a link between a HAPC regulation and a violation of any regulations specific to existing HAPC has not been established.

Regarding the Office of Law Enforcement (OLE) and VMS capabilities, though there is currently no link between OLE and NMFS fisheries managers, VMS data can be used to generate a record of vessels transiting through HAPCs, though not what, if any, fishing activity was taking place. So long as there is no regulation or prohibition restricting transiting or fishing with certain gear, the OLE would not patrol these areas to monitor activities. The OLF consults the VMS baseline map each day, supplementing the VMS data with a general understanding of fisheries in the area.

Under Alternative 2, where skate sites would be designated as HAPC, NMFS would be expected to monitor these sites for potential effects of fisheries on skate eggs and skate populations. Regular analysis of VMS data on trawl intensity at each site (as done for this analysis) could be done each year and reported in the annual Ecosystem SAFE report. This would allow the assessment author, and the Council to know when there are major changes in trawl fishing effort on HAPC areas and potential impacts to skate eggs. Additionally, trends in trawl effort, catch of skate eggs of each species, and effort by other gear types, could be reported regularly as part of the EFH 5-year review. Should a change occur in skate recruitment, or overall biomass of a species, potentially related to fishing impacts on these HAPC sites, the Council could initiate an analysis to take further action to restrict fishing activities at those sites

### **Industry monitoring and accountability**

Public testimony during the February 2012 Council meeting noted the distinctions between identifying HAPCs (Alternative 2) and prohibiting fishing within HAPCs (Alternative 3), and the industry and fleet's ability to self-monitor and identify when fishing is occurring within the HAPCs. Vessels could voluntarily avoid areas of skate egg concentration, and try to do so already, because egg casings are difficult to remove from trawl gear and add to trip time and cost. The fishing industry could help identify areas of skate egg concentration and assist with identification of research needs..

#### **3.4.3 Alternative 3 and Options a-d**

Alternative 3 provides for both the identification of areas of skate egg concentration as HAPCs and for the conservation of these areas through prohibitions of gear types that make contact with the sea floor. The Council may select, in combination with any area of skate egg concentration designated as a HAPC, to limit fishing activities that make contact with the sea floor in these areas by prohibiting the use of "mobile bottom contact," pelagic, "bottom contact," or all fishing gear. The table below summarizes the

gear types that would or would not be allowed in areas of skate egg concentration, based on the option selected.

**Table 14. Summary table of gear type prohibited under each option for Alternative 3.**

<b>Gear type prohibited</b>	<b>Option a</b>	<b>Option b</b>	<b>Option c</b>	<b>Option d</b>
Nonpelagic (bottom) trawl	x	X	x	X
Dredge	x	X	x	X
Dinglebar	x	X	x	X
Pelagic trawl	--	X	--	X
Pot	--	--	x	x
Hook and line (longline)	--	--	x	x

Only Alternative 3 requires enforcement considerations. At the February 2012 meeting, the Enforcement Committee received an overview of the three alternatives presented in the analysis. The Committee noted that if the Council wishes to identify the areas skate egg concentration as HAPCs and wishes to protect and conserve these areas using VMS, there is a minimum size requirement that would allow for protection given the limitations of VMS polling (once or twice per hour), uncertainty in GPS locations, and the spatial dislocation between the vessel and gear. The Committee discussed what the absolute minimum size could be that would still ensure conservation of the resource: an area of 5 nm per side would be an ideal minimum because of the limits of VMS to accurately track a vessel through the area. Areas smaller than 5 nm per side, though providing some level of protection, are unlikely to be successfully enforced.

The Committee’s recommendation under Alternative 3 is to identify HAPC areas of a minimum size to allow effective VMS tracking for enforcement, and to establish HAPC boundaries along latitude and longitude lines, wherever practical. Minimum thresholds should be established with a buffer of at least 1 nm beyond the boundary of the area to be protected in order to account for current VMS capabilities, potential GPS error, and the dislocation between vessels and deployed gear. Should the Council decide to implement trawl gear restrictions for these areas, the Committee also recommends prohibiting all trawl activity in the HAPCs.

At the February 2012 meeting, the AP requested that staff generate a table summarizing sites, species, and fisheries involved at each HAPC site. Specially, the AP asked to see the skate species to be protected and its population trend, the egg casing density and depth at each site, and the fisheries in the site and amount of fish caught in site.

**Table 15. Summary table of HAPC sites, skate species, and fisheries**

Site Name	Skate Species	Depth of Max. Egg Density		Max. Egg Density (eggs/km <sup>2</sup> )	Population Trend <sup>a</sup>	Fisheries	Tons of Catch <sup>b</sup> (mt)
		meters	fathoms				
1. Bering 1	Alaska	145	79	800,406	Stable	PTR Pollock mid-water NPT Atka NPT Pollock NPT Pacific cod NPT other flatfish NPT Flathead sole NPT Other Species NPT Rock sole NPT Arrowtooth	6,576 12 32 677 44 2 347 3 285
2. Bering 2	Aleutian	380	208	62,992	Stable	PTR Pollock, bottom PTR Pollock, mid-water NPT Atka NPT Pollock NPT Pacific cod NPT other flatfish NPT Flathead sole NPT Rock sole NPT Greenland Turbot NPT Arrowtooth NPT Yellowfin	427 7,558 110 35 489 716 298 83 182 5,671 12
3. Bristol	Bering	156	85	6,188	Stable	PTR Pollock, mid-water	5,828
4. Pribilof	Alaska	205	112	16,473	Stable	PTR Pollock, mid-water NPT Arrowtooth	658 25
5. Zhemchug	Alaska	217	118	610,064	Stable	PTR Pollock, mid-water	1,100
6. Pervenets	Alaska, Bering and Aleutian	316	173	334,163	Stable	PTR Pollock, mid-water NPT Pollock NPT Pacific cod NPT Rockfish NPT Flathead sole NPT Greenland Turbot NPT Arrowtooth NPT Yellowfin	14,750 9 205 43 337 48 827 3

<sup>a</sup> Skate stock assessment experts offer population trends for all skate species tend to be stable on the shelf and slope.

<sup>b</sup> Observed PTR and NPT catch data (2003 to 2011) filtered for confidentiality.

### 3.4.4 Option e – research list

Under Alternative 3 Option e, the Council may suggest that the plan teams and the SSC consider adding areas of skate egg case concentration as a research priority to the Council’s annual research priority list, in order to incorporate continuing research into skates, to evaluate skate populations, additional skate egg concentration areas, and their ecology and habitat. Dr. Gerald R. Hoff of the Alaska Fisheries Science Center (AFSC) has compiled the description below of the three most important research priorities, as of February 2012.

In addition, the BSAI skate stock assessment authors have recommended continued study of areas of skate egg concentration to evaluate their importance to population production. Adult skates appear capable of significant mobility in response to general habitat changes, but any effects on the small scale area of skate egg concentration crucial to reproduction could have disproportionate population effects. Eggs are mostly limited to isolated areas of skate egg concentration, and juveniles use different habitats than adults. Changes in these habitats have not been monitored historically, so assessments of habitat quality and its trends are not currently available. After hatching, juveniles most likely remain in

continental shelf and slope waters, but specific distribution is unknown; adults are found across wide areas of the shelf and slope.

**1. Develop a clearer picture of the habitat conditions that produce such incredible productive potential at sites of skate egg deposition:**

In the eastern Bering Sea, no less than eight areas of skate egg concentration occur between 135 and 400m for the three most abundant skate species: Alaska, Aleutian, and Bering. These sites are highly correlated with undersea marine canyons, egg cases are highly concentrated, and sites are persistent for many years. There is evidence of site fidelity by mature adults with protracted embryo development causing multiple cohorts to be present concurrently at any site. A clearer understanding of the specific oceanographic and biological processes that are common to areas of skate egg concentration across species, bottom types and major ecosystems will provide a framework for developing a working hypothesis of the habitat conditions necessary for successful recruitment. An understanding of habitat parameters common to areas of skate egg concentration will provide estimates of the influence of climate change, habitat disturbance, and ecosystem shifts on these vulnerable species.

**2. Monitoring of known skate sites to determine the effect of protective measures:**

A site of egg concentration for the Alaska skate at the head of the Bering Canyon has undergone activity from fishing for at least thirty years. Digital images of this site, when compared to three other eastern Bering Sea sites for the Alaska skate, show this site to possess distinct properties with regard to bottom type and egg case distribution. The benthic habitat is comprised of soft “fluffy” sediment and egg cases are highly scattered over a broad area when compared to distinctly hard sand and gravel bottom types with areas of highly concentrated egg cases at the three more northern sites. Developing a monitoring program that includes frequent studies of this site as to changes in benthic habitat, egg density and skate population will provide valuable information on the success of protective measures and information on the recovery time for this important habitat. Research for monitoring this habitat would include underwater camera systems and oceanographic equipment.

**3. Examine population structure as determined by site fidelity to areas of skate egg concentration:**

Population structure in skates is an important aspect to understand skate reproduction. In the eastern Bering Sea, the Alaska skate has at least four areas of egg concentration. There is evidence of site fidelity for egg deposition which potentially may help develop population structure within this large ecosystem. Understanding the specific role these and other areas of egg concentration play in successful recruitment and development of skate adult populations is key to the successful management of these sensitive species. Research leading to these questions will involve genetic studies and a tagging program to monitor adult behavior at sites of egg concentration.

**3.4.5 Option f – BSAI Amendment 89**

The Council may approve the consolidation of figures and tables that describe areas in Amendment 89 to the BSAI Groundfish FMP, which establishes Bering Sea habitat conservation measures. Color Figures 66-69 in Appendix B describe the Bering Sea Habitat Conservation Area, the Northern Bering Sea Research Area and Saint Lawrence Island Habitat Conservation Area (HCA), and the Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area, respectively. The final rule (73 FR 43362, July 25, 2008) which implemented Amendment 89 created new coordinate tables and figures for the areas closed to nonpelagic (i.e., bottom) trawling and the research area. NMFS has determined that these

figures need to be combined with the coordinates of four tables in 50 C.F.R. part 679.

NMFS has determined that three figures in Amendment 89 to the BSAI Groundfish FMP need to be consolidated and combined with the coordinates of four tables in 50 C.F.R. part 679.) Amendment 89 establishes Bering Sea habitat conservation measures (73 FR 43362, July 25, 2008). Amendment 89 prohibits nonpelagic trawling in certain waters of the Bering Sea subarea to protect bottom habitat from the potential adverse effects of nonpelagic trawling. Amendment 89 also establishes the Northern Bering Sea Research Area for studying the impacts of nonpelagic trawling on bottom habitat.

The final rule that implemented Amendment 89 created new coordinate tables and figures for the areas closed to nonpelagic trawling and the research area (73 FR 43362, July 25, 2008). The Bering Sea Habitat Conservation Area; the Northern Bering Sea Research Area; and the Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area are described in Tables 42, 43, and 44, and in Figures 16, 17, and 21 to 50 C.F.R. part 679, respectively. St. Lawrence Island Habitat Conservation Area is described in Table 45 and Figure 17 to part 679. The St. Matthew Island Habitat Conservation Area is described in Table 46 to part 679. It is unnecessarily complicated for the public to refer to one page for the map of the area and refer to one or more other pages for the coordinates of the same area.

The standard format of the 50 CFR part 679 regulations has one graphic with a figure number to contain both the (a) map and the (b) coordinates that describe the map. To meet that standard format, this rule would combine the appropriate coordinates and figures into one figure and would remove those tables affected in this process. Figure 16, a map, would be combined with the coordinates provided in Table 42 for the Bering Sea Habitat Conservation Area. Figure 17 would be combined with Tables 43 and 45 for the Northern Bering Sea Research Area and St. Lawrence Island Habitat Conservation Area. Figure 21 would be combined with Table 44 for the Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area. Table 46 does not have a comparable figure and therefore would be re-designated as Table 42. Tables 43, 44, and 45 would be removed. Color Figures 66-69 in Appendix B show the Bering Sea Habitat Conservation Area, the Northern Bering Sea Research Area and Saint Lawrence Island Habitat Conservation Area (HCA), and the Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area, respectively.

### **3.5 Delineation of HAPCs**

Six areas of skate concentration in the BSAI management area are proposed for designation as HAPCs. These sites have been identified by NMFS and AFSC scientists. Each site has been studied and mapped using research bottom trawls to determine the density of egg cases, the extent of the area of skate egg concentration, mortality sources to young skates, and distinguishing abiotic features of the site that may define EFH. The exception is the Pribilof site, which was mapped using an autonomous underwater vehicle (AUV) equipped with a high-resolution camera. Additional AUV mapping work has been performed at several of the other sites listed, but those data were not used to delineate the boundaries of the proposed areas. At each site, the spatial extent of bottom trawls containing more than 1,000 egg cases per km<sup>2</sup> was established.

Under Alternative 2, the boundary lines are snapped to the nearest minute of latitude or longitude away from the center of the area of skate egg concentration. This snapping creates a buffer region to account for the possibility of additional eggs in un-sampled areas. Using whole minutes also allows for a simpler boundary line that will be easier to discern by fishing vessels, regulators, and policymakers.

For effective enforcement and monitoring, and in response to the recommendations of the Enforcement Committee, Alternative 3 establishes minimum size thresholds around the core concentration areas that are at least 5 nm to a side and, where appropriate, enlarged with a buffer of 1 nm beyond the original

boundary. Boundaries are then snapped outward to the nearest minute of latitude and longitude. See Appendix B – Color Figures 3-8 and 40.

### **3.5.1 Concentration Threshold**

Data for the AFSC HAPC proposal and this analysis was collected predominately from bottom trawl directed studies at skate egg concentration sites where an adaptive sampling strategy was applied. The goal was to identify the areas of high skate egg case concentration and subsequently move in all four (or more) directions away from the center to detect the drop in egg case density, and therefore locate the extent of the egg concentration site. In the process, and due to mechanics of trawling, ability to clean the net, and the moderate scattering of empty egg cases out of the area of skate egg concentration, it was found that there is a slight ‘contamination’ from one trawl to the next due to the entanglement of skate eggs in the trawl cod-end. A threshold of 1,000 eggs/km<sup>2</sup> equates to approximately ten eggs encountered in the trawl and during the study was often found to be from a previous tow. Because of the uncertainty of this low level, it has been designated as background levels and not included as part of the egg concentration area. See Appendix B – Color Figures 9-24, 40, and 47-48.

From the AFSC standard trawl survey conducted on an annual basis throughout the eastern Bering Sea, encountering skate eggs at this threshold level (1,000 eggs/km<sup>2</sup>) can be frequent and does not indicate an area of skate egg concentration in that immediate area. There are several possible explanations why there may be low level skate eggs widely scattered outside concentration sites, which include: 1) a certain amount of “wandering” by skates where they deposit eggs randomly away from concentration sites for unknown reasons; 2) the distance a skate may be from an area of skate egg concentration when the eggs are ready to deposit and concentration occurs whether inside a concentration site or not; 3) newly maturing skates may have a learning curve to find the appropriate habitat and they may not be successful immediately upon maturation; and 4) there may be scatter out of the concentration site due to currents, predator disturbances, or fishers disturbances. Throughout this analysis, an order of magnitude greater (10,000 eggs/km<sup>2</sup>) than background has been used to identify area of skate egg concentration from survey trawls or commercial fishing and this method has been very reliable on the determination of egg concentration sites when egg encounters at level of ~100 eggs in a single trawl (10,000 eggs/km<sup>2</sup>).

### **3.5.2 Shape of Area**

At the February 2011 Council Meeting, the Enforcement Committee received a preliminary review of proposed skate HAPCs and made recommendations on the most appropriate shape. The Committee recommended that the Council maintain square- or rectangular-shaped closures. Areas closed to certain gear types for conservation are more practical to enforce if they are square- or rectangle-shaped. It is more clear that a fishing vessel is either west/east or north/south of a delineation, and therefore, in or outside a closed area using VMS or aircraft overflight. This clarity also benefits fishing vessels in avoiding or inadvertently entering a closure.

At the February 2012 Council meeting, the Enforcement Committee took up the initial review analysis and recommended that area boundaries be aligned with lines of latitude and longitude, to the greatest extent practical, as it is more practical for enforcement personnel and USCG pilots to quickly determine whether a vessel is inside or outside of a protected area with margins along latitude and longitude lines than an irregularly shaped area.

## **3.6 Skate Biology**

Skates (from the family Rajidae) are cartilaginous fishes related to sharks. Skates are dorso-ventrally depressed animals with large pectoral “wings” attached to the sides of the head, and long, narrow whip-

like tails. There are at least fifteen species of skates in three genera, *Raja*, *Bathyraja*, and *Amblyraja*, distributed throughout the eastern North Pacific, and common from shallow inshore waters to very deep benthic habitats (Eschmeyer et al. 1983, Stevenson et al. 2006). The table below lists the fifteen skate species found in Alaskan waters:

**Table 16. Skate species found in the North Pacific Ocean**

<b>Common Name</b>	<b>Species Nomenclature</b>
*Alaska skate	<i>Bathyraja parmifera</i>
*Aleutian skate	<i>Bathyraja aleutica</i>
*Bering skate (complex?)	<i>Bathyraja interrupta</i>
deepsea skate	<i>Bathyraja abyssicola</i>
Commander skate	<i>Bathyraja lindbergi</i>
whiteblotched skate	<i>Bathyraja maculate</i>
butterfly skate	<i>Bathyraja mariposa</i>
whitebrow skate	<i>Bathyraja minispinosa</i>
“Leopard” parmifera	<i>Bathyraja sp. cf. parmifera</i>
mud skate	<i>Bathyraja taranetzi</i>
rougtail skate	<i>Bathyraja trachura</i>
Okhotsk skate	<i>Bathyraja violacea</i>
big skate	<i>Raja binoculata</i>
roughshoulder skate	<i>Amblyraja badia</i>
longnose skate	<i>Raja rhina</i>

\* The three representative skate species in defining EFH.

The species within the skate assemblage occupy different habitats and regions within the BSAI FMP area: the eastern Bering Sea shelf (less than 200m depth), the eastern Bering Sea slope (greater than 200 m depth), and the Aleutian Islands region (all depths). Within the eastern Bering Sea, the skate species composition varies by depth, and species diversity is generally greatest on the upper continental slope at 250 to 500 m depth (Stevenson et al. 2006).

While skate biomass is much higher on the eastern Bering Sea shelf than on the slope, skate diversity is substantially greater on the slope. The dominant species on the slope is the Aleutian skate (*B. aleutica*). A number of other species are found on the eastern Bering Sea slope in significant numbers, including the Alaska skate, Commander skate (*B. lindbergi*), whiteblotched skate (*B. maculata*), whitebrow skate (*B. minispinosa*), rougtail skate (*B. trachura*), and mud skate (*B. taranetzi*). Two rare species, the deepsea skate (*B. abyssicola*) and roughshoulder skate (*Amblyraja badia*), have only recently been reported from eastern Bering Sea slope bottom trawl surveys (Stevenson and Orr 2005). The Okhotsk skate (*B. violacea*) is also occasionally found on the eastern Bering Sea slope.

The skate complex in the Aleutian Islands (AI) is quite distinct from the eastern Bering Sea shelf and slope complexes, with different species dominating the biomass, as well as at least one endemic species, the recently described butterfly skate, *Bathyraja mariposa* (Stevenson et al. 2004). In the AI, the most abundant species is the whiteblotched skate, *B. maculata*. The whiteblotched skate is found primarily in the eastern and far western Aleutian Islands. Aleutian and Alaska skates are also common in the AI. The mud skate (*B. taranetzi*) is relatively common in the AI but represents a lower proportion of total biomass because of its smaller body size. The common species formerly known as the Alaska skate in the western Aleutians looks very different from the Alaska skate found on the shelf. The Aleutian Islands type or “leopard skate” (*Bathyraja sp. cf. parmifera*) has been confirmed to be a separate species.

All known area of skate egg concentration in the eastern Bering Sea are associated with several major and minor undersea marine canyons located in the upper low slope areas occurring from 145 to 380 m (see Appendix B – Color Figures 41-46). Most likely particular oceanographic conditions are important factors for area selection; however, the specifics of these conditions remain unknown. The nominal six areas of skate egg concentration encompassed in this HAPC proposal include those of the three most abundant skate species in the eastern Bering Sea, which encompasses the dominant species on the shelf (from 20 to 200 m) that is most encountered by fishing activity in the eastern Bering Sea: the Alaska, Aleutian, and Bering.

### **3.6.1 Alaska Skate**

The eastern Bering Sea shelf skate complex is dominated by a single species, the Alaska skate (*Bathyraja parmifera*). The Alaska skate is distributed throughout the eastern Bering Sea shelf habitat area, most commonly at depths of 50 to 200 m (Stevenson 2004), and has accounted for between 91 percent and 97 percent of aggregate skate biomass estimates since species identification became reliable in 1999. The Alaska skate has the greatest estimated population of all the Alaska skate species and dominates the eastern Bering Sea shelf. Its population has increased dramatically since the 1970s and in recent years, has been encountered at nearly every station throughout the standard eastern Bering Sea trawl survey. It has limited distribution from off Japan throughout the eastern Bering Sea and into the GOA. It occurs in the Aleutians to as far as 180° W, where it is replaced by a very similar species (Leopard skate, *Bathyraja panthera*) once thought to be a conspecific by recently described and documented as a congener. The Alaska skate trends towards having species specific cocentration sites with little “contamination” of other species eggs at its sites (see Appendix B – Color Figures 52-53). Areas of skate egg concentration for the Alaska skate tend to be shallower than others, most likely because it is the shallowest of the skate species in the eastern Bering Sea. Another distinction of Alaska skate areas of egg concentration are their deposition of eggs in very high densities (greater than 800,000 eggs/km<sup>2</sup>), an order of magnitude greater than either the Bering or Aleutian skates. This is not surprising given that its population estimates are also an order of magnitude greater than any other eastern Bering Sea species.

### **3.6.2 Bering Skate**

The Bering or sandpaper skate (*B. interrupta*) is the next most common species on the eastern Bering Sea shelf, and is distributed on the outer continental shelf. The Bering skate is an enigmatic species in many respects. It occurs from Japan throughout Alaska and at least as far south as the Mexican border off California. However, it shows a large amount of morphological variation across its range and in fact appears different in each environment where it occurs. Within the eastern Bering Sea, there are a minimum of three morphological types varying with depth and latitude, a fourth type in the Gulf of Alaska and finally along the west coast of Washington, Oregon and California a fifth type appearing distinctly different than those in Alaska. Examination of egg case morphology corroborates the differences seen within the species across its range. Taxonomic resolution of this complex is underway and the results may determine what is currently recognized as a single species may in fact be three to five species. This complicates any life history, habitat, and ecological studies and interpretation of such for the species. However, for this analysis all Bering skates will be considered a single species with the understanding that a conservative approach may be necessary given the dubious status of the species complex.

### **3.6.3 Aleutian Skate**

The Aleutian skate (*Bathyraja aleutica*) has the largest estimated population and biomass along the eastern Bering Sea slope (from 200 to 1200 m). It is one of the most broadly distributed species occurring throughout Alaska, the eastern Bering Sea, AI, and GOA, British Columbia, and south to California. It also has the greatest depth distribution from about 150 m to at least 1200 m. The two known areas of skate egg concentration in the eastern Bering Sea are of moderate to deep depths, however occur

relatively shallow when compared to the depth distribution for the species. The Aleutian skate deposits its egg cases at a relatively low density not found over 100,000 eggs/km<sup>2</sup> and tends to have a fair amount of “contamination” by other species such as the Bering skate, mud skate, and whitebrow skate. The Aleutian skate however, does not appear to deposit its eggs in large numbers other than in its own areas of skate egg concentration and eggs are rarely found widely scattered outside those sites.

### 3.6.4 Life History and Stock Structure

Skate life cycles are similar to sharks, with relatively low fecundity, slow growth to large body sizes, and dependence of population stability on high survival rates of a few well developed offspring (Moyle and Cech 1996). Skates and sharks in general have been classified as “equilibrium” life history strategists (Winemiller and Rose 1992), with very low intrinsic rates of population increase implying that sustainable harvest is possible only at very low to moderate fishing mortality rates (King and McFarlane 2003). Within this general equilibrium life history strategy, there can still be considerable variability between skate species in terms of life history parameters (Walker and Hislop 1998). While smaller sized species have been observed to be somewhat more productive, large skate species with late maturation (11 or more years) are most vulnerable to heavy fishing pressure (Walker and Hislop 1998; Frisk et al. 2001; Frisk et al. 2002). Little is known about life history parameters of Alaska skate. Studies own elsewhere have determined age at maturity and maximum age for big skates and longnose skates to be about 12 to 26 years, with maturity occurring at approximately 8 years.

Several recent studies have explored the effects of fishing on a variety of skate species in order to determine which life history traits might indicate the most effective management measures for each species. Major life stages include the egg stage, the juvenile stage, and the adult stage (summarized here based on Frisk et al. 2002). All skate species are oviparous (egg-laying), investing considerably more energy per large, well-protected embryo than most commercially exploited teleost groundfish. The large, leathery egg cases incubate for extended periods (several months to over a year) in benthic habitats, exposed to some level of predation and physical damage, until the fully formed juveniles hatch. The juvenile stage lasts from hatching through maturity, several years to over a decade depending on the species.

The reproductive adult stage may last several more years to decades depending on the species. Age and size at maturity and adult size and longevity appear to be more important predictors of resilience to fishing pressure than fecundity or egg survival in the skate populations studied to date. Frisk et al. (2002) estimated that although annual fecundity per female may be on the order of less than fifty eggs per year (extremely low compared with teleost groundfish), there is relatively high survival of eggs due to the high parental investment, and therefore egg survival did not appear to be the most important life history stage contributing to population stability under fishing pressure. Juvenile survival appears to be most important to population stability for most North Sea species studied (Walker and Hislop 1998) and for the small and intermediate sized skates from New England (Frisk et al. 2002).

For the large and long-lived barndoor skate, adult survival was the most important contributor to population stability (Frisk et al. 2002). Comparisons of length frequencies for surveyed North Sea skates from the mid and late 1900s led Walker and Hislop (1998, p. 399) to the conclusion that after years of very heavy exploitation “all the breeding females, and a large majority of the juveniles, of *Dipturus batis*, *Leucoraja fullonica* and *R. clavata* have disappeared, whilst the other species have lost only the very largest individuals.” Although juvenile and adult survival may have different importance by skate species, all studies found that one metric, adult size, reflected overall sensitivity to fishing. After modeling several New England skate populations, Frisk et al. (2002, p. 582) found “a significant negative, nonlinear association between species total allowable mortality, and species maximum size.” This may be an oversimplification of the potential response of skate populations to fishing; in reality it is the interaction

of natural mortality, age at maturity, and the selectivity of fisheries which determines a given species' sensitivity to fishing and therefore the total allowable mortality (i.e., ABC).

### **3.6.5 Embryology and Development Duration**

Fecundity is a very difficult quantity to measure in skates, as individuals of some species may reproduce throughout the year and thus the number of mature or maturing eggs present in the ovary may represent only a fraction of the annual reproductive output. Matta (2006) estimated the average fecundity of the Alaska skate to range between 21 and 37 eggs per female per year, based on the assumed relationship between reproductive potential and  $M$  (Gunderson 1997). Additional work, such as laboratory rearing experiments, is needed to validate these estimates.

Eggs are deposited in horny cases on the floor of the continental shelf and slope. Development time for oviparous elasmobranchs is dependent of environmental temperature. A retrospective analysis of 14 species worldwide from field and laboratory studies demonstrates that the relationship between environmental temperature during development and time describe an exponential curve and display the well-known  $Q_{10}$  effect of temperatures influence on metabolic rates of ectotherms (see Appendix B – Color Figures 50 and 59). The result is that in tropical to temperate waters, oviparous elasmobranchs emerge from the egg case in the range of one to six months after concentration. However, in sub-temperate to sub-arctic waters such as the North Pacific, the development time is dramatically extended taking years for embryo development. Field and recent laboratory studies conducted on the Alaska skate confirms that at environmental temperatures experienced in the eastern Bering Sea, time to emergence for juvenile skates is greater than three years (see Appendix B – Color Figures 50 and 58-59).

With annual egg concentration events at skate egg concentration sites, it is expected there will be multiple cohorts at any given moment in time since new eggs are deposited at a faster rate than embryo development. Appendix B – Color Figure 58 shows within an egg concentration site there are multiple embryo length modes at a particular instance, where in the case of the Aleutian skate-Pervenets Canyon having up to seven cohorts developing simultaneously. Because of temperatures influence on development time, skates have optimized egg concentration locations along the slope where sites selected possess warm annual temperatures for any given latitude (Appendix B – Color Figure 50). Due to currents and the strong influence the central eastern Bering Sea cold pool has on the outer shelf waters; for a given depth in the upper 400 m of the slope bottom temperatures are colder with increased latitude. The shelf condition influence dissipates at about 400 m and below this depth all latitudes show similar depth temperature relationships. This phenomenon explains why a single species' concentration sites are continually deeper at increased latitude in the eastern Bering Sea (Appendix B – Color Figure 50).

### **3.6.6 Role of Skates in the Ecosystem**

This section focuses on the Alaska skate in the Bering Sea and Aleutian Islands (BSAI), with all other species found in each area summarized within the group "Other Skates." Aggregation is necessary due to current data constraints. Skates are predators in the BSAI FMP area. Some species are piscivorous while others specialize in benthic invertebrates; additionally, at least three species, deepsea skate, rougtail skate, and longnose skate, are benthophagic during the juvenile stage but become piscivorous as they grow larger (Ebert 2003, Robinson 2006). Each skate species would occupy a slightly different position in eastern Bering Sea and Aleutian Islands food webs based upon its feeding habits, but in general skates as a group are predators at a relatively high trophic level. In the eastern Bering Sea, the skate biomass is dominated by the Alaska skate, which eats primarily pollock (as do most other piscivorous animals in the BSAI). Aside from sperm whales, most of the "predators" of BSAI skates are fisheries. Cod and halibut are both predators and prey of skates.

In terms of annual tons removed, it is instructive to compare fishery catches with predator consumption of skates. While estimates of predator consumption of skates are perhaps more uncertain than catch estimates, the ecosystem models incorporate uncertainty in partitioning estimated consumption of skates between their major predators in each system. The predators with the highest overall consumption of Alaska skates in the eastern Bering Sea are sperm whales, which account for less than 2 percent of total skate mortality and consumed between 500 and 2,500 tons of skates annually in the early 1990s. Consumption of eastern Bering Sea Alaska skates by Pacific halibut and cod are too small to be reliably estimated. Similarly, sperm whales account for less than 2 percent of Other Skate mortality in the eastern Bering Sea, but are still the primary predator of Other Skates, consuming an estimated 50 to 400 tons annually. Pacific halibut consume very small amounts of Other Skates in the eastern Bering Sea, according to early 1990s information integrated in ecosystem models.

The predators with the highest consumption of Alaska skates in the AI are also sperm whales, which account for less than 2% of total skate mortality and consumed between 20 and 120 tons of skates annually in the early 1990s. Pinnipeds (Steller sea lions) and sharks also contributed to Alaska skate mortality in the AI, averaging less than 50 tons annually. Similarly, sperm whales account for less than 2% of Other Skate mortality in the AI, but are still the primary predator of Other Skates there, consuming an estimated 20 to 150 tons annually. Pinnipeds and sharks consume very small amounts of Other Skates in the AI, according to early 1990s information. Dr. Hoff's research on areas of skate egg concentration suggests that gastropod predation on skate egg cases may account for a significant portion of mortality during the embryonic stage, and Pacific cod and Pacific halibut consume substantial numbers of newly hatched juvenile skates within areas of skate egg concentration. These sources of mortality may be included in future stock assessments.

Diets of skates are derived from food habits collections taken in conjunction with eastern Bering Sea and AI trawl surveys. Skate food habits information is more complete for the eastern Bering Sea than for the AI, but we present the best available data for both systems here. Over 40% of eastern Bering Sea Alaska skate diet measured in the early 1990s was adult pollock, and another 15% of the diet was fishery offal, suggesting that Alaska skates are opportunistic piscivores. Eelpouts, rock soles, sandlance, arrowtooth flounder, salmon, and sculpins made up another 25-30% of Alaska skates' diet, and invertebrate prey made up the remainder of their diet. This diet composition combined with estimated consumption rates and the high biomass of Alaska skates in the eastern Bering Sea results in an annual consumption estimate of 200,000 to 350,000 tons of pollock annually.

Eastern Bering Sea Other Skates also consume pollock (45% of combined diets), but their lower biomass results in consumption estimates ranging from 20,000 to 70,000 tons of pollock annually. Other Skates tend to consume more invertebrates than Alaska skates in the eastern Bering Sea, so estimates of benthic epifaunal consumption due to Other Skates range up to 50,000 tons annually, higher than those for Alaska skates despite the disparity in biomass between the groups.

Because Alaska skates and all Other Skates are distributed differently in the eastern Bering Sea, with Alaska skates dominating the shallow shelf areas and the more diverse species complex located on the outer shelf and slope, we might expect different ecosystem relationships for skates in these habitats based on differences in food habits among the species. Similarly, in the AI the unique skate complex has different diet compositions and consumption estimates from those estimated for eastern Bering Sea skates. The skate in the AI formerly known as the Alaska skate is opportunistically piscivorous like its eastern Bering Sea relative, feeding on the common commercial forage fish, Atka mackerel (65% of diet) and pollock (14% of diet), as well as fishery offal (7% of diet). Diets of Other Skates in the AI are more dominated by benthic invertebrates, especially shrimp (pandalid and non-pandalid total 42% of diet), but include more pelagic prey such as juvenile pollock, adult Atka mackerel, adult pollock and squids (totaling 45% of diet).

Estimated annual consumption of Atka mackerel by AI Alaska skates in the early 1990s ranged from 7,000 to 15,000 tons, while pollock consumption was below 5,000 tons. Shrimp consumption by AI Other Skates was estimated to range from 4,000 to 15,000 tons annually in the early 1990s, and consumption of pollock ranged from 2,000 to 10,000 tons. Atka mackerel consumption by AI Other Skates was estimated to be below 5,000 tons annually. The diet composition estimated for AI Other Skates is likely dominated by the biomass dominant species in that system, whiteblotched skate and Aleutian skate. The diet compositions of both Aleutian and whiteblotched skates in the AI appear to be fairly diverse, and are described in further detail in Yang (2007) along with the diets of big skate, Bering skate, Alaska skate, rougtail skate, and mud skate in the AI.

In the future, scientists hope to use diet compositions to make separate consumption estimates for whiteblotched and Aleutian skates along with Alaska skates in the AI. Examining the trophic relationships of eastern Bering Sea and AI skates provides a context for assessing fishery interactions beyond the direct effect of bycatch mortality. In both areas, the biomass-dominant species of skates feed on commercially important fish species, so it is important for fisheries management to maintain the health of pollock and Atka mackerel stocks in particular to maintain the forage base for skates (as well as for other predators and for human commercial interests).

### **3.7 Probable Environmental Impacts**

The proposed action is limited to six locations in the eastern Bering Sea and to fishing activities that make contact with the sea floor. Any effects of this action are therefore limited to these six locations and to any component of the environment that may be impacted by fishing activities that make contact with the sea floor in these locations. Under Alternative 1, the status quo or no action alternative, no environmental impacts would occur. Under Alternative 2, the Council would identify any of the proposed areas of skate egg concentration as HAPCs, but would not adopt any gear type prohibitions or restrict any fishing activities. Therefore, the effects of Alternative 2 are expected to be the same as for the no action alternative.

Under Alternative 3, though, the Council would identify proposed areas of skate egg concentration as HAPCs and would adopt conservation and management measures prohibiting certain gear types within HAPCs. This section describes the criteria by which the impacts of the proposed action are analyzed for each of the following resource categories:

- Habitat
- Target Species (i.e, skates species)
- Non-target species
- Marine mammals and seabirds
- Ecosystem

Evaluation criteria have been developed for each of these categories recently within NMFS' HAPC EA (2006) and in the 2006-2007 Groundfish Harvest Specifications EA. The EFH EIS provide recent information on the effects of fishing on EFH. The analysis used in this EA draws upon the evaluations used in the EFH EIS and adopts the significance criteria used in the HAPC EA and the 2006-2007 Groundfish Harvest Specifications EA because of the similar type of action analyzed and the latest information provided by these analyses.

The four ratings used to assess each potential effect are:

- **Significantly negative:** Significant adverse effect in relation to the reference point. Information, data, and/or professional judgment indicate that the action will cause a significant adverse effect on the resource.
- **Insignificant impact:** Insignificant effect in relation to the reference point. Information, data, or professional judgment suggests that the action will not cause a significant adverse effect on the resource.
- **Significantly positive:** Significant beneficial effect in relation to the reference point. Information, data, and/or professional judgment indicate that the action will cause a significant benefit to the resource.
- **Unknown:** Unknown effect in relation to the reference point. Information is absent to determine a reference point for the resource, species, or issue and data is insufficient to adequately assess the effect of the action or the direction of the effect of the action. Professional judgment also is not able to determine the effect of the action on the resource.

The reference point condition, where used, represents the state of the environmental component in a stable condition or in a condition judged not to be threatened at the present time. For example, a reference point condition for a fish stock would be the state of that stock in a healthy condition, able to sustain itself, successfully reproducing, and not threatened with a population-level decline. Significance criteria are provided for each of the resource categories listed above, except for socioeconomic effects. Significance findings for social and economic impacts would not by themselves require the preparation of an EIS; see 40 CFR 1508.14. Economic and social impacts are described in Sections 3.8.6 and 4.5. In light of 40 CFR 1508.14, significance determinations are not made for these impacts.

This section will focus on the effects of Alternatives 2 and 3 and the options on fish habitat, target species (i.e., skates specieses), non-target species, marine mammals and seabirds, ecosystems, and cumulative effects on the human environment. Effects will be compared to the significance criteria for each component and compare the effects to Alternative 1 status quo effects.

### **3.7.1 Habitat**

This section provides descriptions of fishing gear and methods used in the proposed HAPCs and their effects on fish habitat. It is a summary of the more detailed analysis of the studies most pertinent to the gear and habitats of the Alaska region found in the EFH EIS (NMFS 2005). Only a few studies have been completed in Alaska on the habitat effects of fishing gear, so the review incorporates the results of pertinent studies from other regions. The descriptions and research summaries below are organized by gear type.

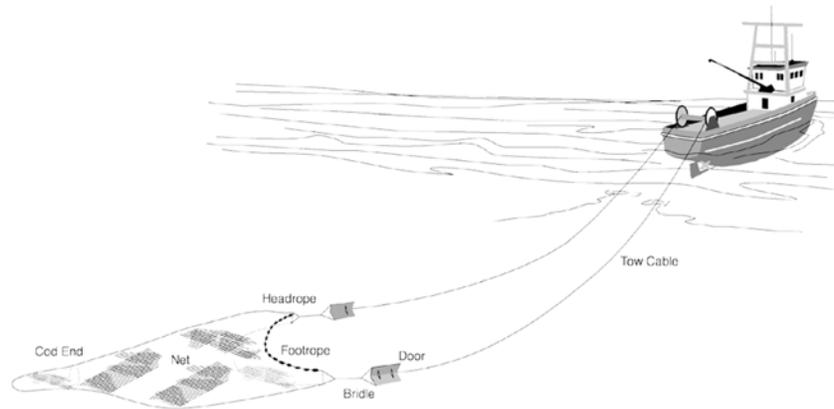
Five main classes of fishing gear are used in the fisheries affected by the proposed alternatives: trawls (pelagic and nonpelagic, or bottom), scallop dredges, longlines (or hook and line fishing), pots, and troll gear (including dinglebar). These gear types have different characteristics that determine their impact on the benthic environment and on the amount of habitat encountered. Effects also depend on properties of the substrate and organisms. Because no comprehensive, systematic surveys have been conducted on the effects of these gears on habitat, this information is based on the knowledge of NMFS gear researchers and related information available to them.

Research conducted on the effects of fishing gear on benthic habitats broadly recognizes several factors that influence the occurrence and degree of effect. Among these are a) the intensity of fishing, b) the frequency of fishing, c) the class and specific characteristics of the fishing gear, d) the environmental/

habitat characteristics, and e) the level of naturally occurring disturbance. This section summarizes worldwide literature on the habitat effects of fishing gear relevant to the groundfish fisheries of Alaska, which is discussed and referenced in greater detail in the EFH EIS (NMFS 2005).

### 3.7.1.1 Nonpelagic Trawls (Bottom Trawls)

Nonpelagic trawls (i.e., bottom trawls), as shown the figure below, are conical nets that are pulled through the water, gathering fish into the open forward end and retaining them in a restricted bag (codend) at the back end. This type of trawl has four main components that may contact the seabed: doors, sweeps, footrope, and netting.



**Figure 6. Schematic of nonpelagic, or bottom, trawling.**

Doors are flattened metal structures that ride vertically in the water and use the force of their motion through the water to spread the net horizontally. Some bottom trawl doors also use contact with the sea floor to augment this hydrodynamic spreading force. The weight of the doors (and some hydrodynamic forces) overcomes the upward pull of the towing cables to force the net down into the water.

Sweeps (as the term is used here; nomenclature varies between regions and individuals) are steel cables that connect the doors to the trawl net. Fiber and combination fiber and steel cables are also used. On bottom trawls, sweeps are required to have elevating devices (bobbins) that lift the wire at least 2.5 inches from the sea floor. The footrope consists of cable or chain connected along the bottom edge of the trawl net and is designed to contact the sea floor on bottom trawls. A 1996 survey of footrope types used off Alaska (168 observers delivered and returned forms from 95 vessels) indicated that all vessels used large-diameter (averaging 39 to 47cm by fishery) cones, spheres, or disks (i.e., bobbins). These bobbins are usually made of rubber, strung over the entire length of the footrope. Large-diameter bobbins are separated by sections of small-diameter disks, creating openings under the footrope that are an average of 13 cm in height and average two-thirds of the footrope in length. Elevating most of the footrope above the seabed reduces damage to netting and bycatch of crabs and other invertebrates. During fishing, the footrope is shaped like a horizontally spread “U” with the opening forward. Bobbins are nearly always used on the sides of the U (wings). In the center section, “tire gear” is used for cod, rockfish, and Dover and rex sole, as reported in all six reports from the Atka mackerel fishery and about half of the reports from the GOA fisheries. This gear consists of vehicle tires or sections of tires linked side-by-side to form a continuous cylinder (averaging 68 cm in diameter). Tire gear and other large-diameter bobbins are very effective at protecting the netting and making it possible to fish in areas with hard and uneven substrates.

The netting is the most easily damaged component of bottom trawls; hence, trawls are designed to prevent the netting from contacting the sea floor. Bobbin or tire footropes raise the netting so that only

particularly prominent sea floor features should touch the netting. If the codend contained enough fish sufficiently heavier than water (flatfish) or rocks, pulling it down to the sea floor, the bottom of the codend would drag across the sea floor. Because codends have to be pulled up the vessel's stern ramp, they are equipped with ropes that limit their diameter to less than 8 feet, which also limits the amount of bottom affected by a dragging codend. Chafing gear is also installed on the underside of the codend to prevent damage to the net during towing, which probably also reduces the amount of interaction between habitat and the web of the trawl.

An important aspect of gear design, when considering bottom habitat effects, is the proportion of the trawl contact footprint that is made by each of the components. Trawl doors used in Alaska are typically less than 3 m along the edge that contacts the sea floor; because they are fished at an angle to their direction of movement, the doors will affect a path narrower than 3 m. The length of the sweeps will vary with target species, substrate, and individual/operator preference. A large vessel targeting flatfish on a smooth bottom may use 350 m of sweeps on each side, while a small rockfish trawler on rough bottom may only use 30 m. Adjusting for the angle of the sweeps, the sweep path may vary from 10 to 100 m on either side of the net. Thus, the area covered by the sweeps can vary significantly. The width of the trawl net itself will depend on how large a trawl the vessel can pull and whether a high opening or a wide, low trawl is selected. An approximate range would be from 12 to 30 m wide. Thus, most of the trawl's footprint results from the sweeps, followed by the footrope, with a relatively small area contacted by the doors.

Alaska experiences lower overall fishing intensity relative to many of the areas where fishing effects research has been done (i.e., NW Atlantic and North Sea). Overall, the areas experiencing trawling intensities above one trawl tow per year in small (5 by 5 km) areas are less than 2% for the eastern Bering Sea, 3% for the Aleutians, and 2% for the GOA; in comparison, it is 56% for the northeastern region's fisheries.. Estimated for each study summarized below are fishing intensities, in number of trawl contacts of studied locations.

While Alaska marine waters include a full range of substrates, the dominant bottom trawl fisheries target species that primarily occur over sand and gravel substrates, including yellowfin and rock soles and cod. Studies on silt/clay environments are more relevant to the smaller fisheries for flathead, Dover and rex soles, and Alaska plaice. Studies of hard bottom, gravel, and boulder habitats are most applicable to the rockfish and Atka mackerel fisheries of the GOA and AI.

While fishing depths off of Alaska also range widely (10 to 1,000 m), most of the effort is concentrated in the 25 to 100 m range. Average fishing depth is deeper in the GOA than in the eastern Bering Sea, with more effort in the 100 to 200 m range. Alaska fisheries are conducted between latitude 51° and 61° N. Biotic habitat responses affecting recovery may be different in warmer climates.

Based on the information available to date, the predominant direct effects caused by bottom trawling include smoothing of sediments, moving and turning of rocks and boulders, re-suspension and mixing of sediments, removal of seagrasses, damage to corals, and damage or removal of epibenthic organisms. Trawls affect the sea floor through contact of the doors and sweeps, footropes and footrope gear, and the net sweeping along the sea floor. Trawl doors leave furrows in the sediments that vary in depth and width depending on the shoe size, door weight, and seabed composition. The footropes and net can disrupt benthic biota and dislodge rocks. Larger sea floor features or biota are more vulnerable to fishing contact, and, larger diameter, lighter footropes may reduce damage to some epifauna and infauna.

Seamounts are also affected by trawl fishing. Corals from seamount slope areas comprised the largest bycatch from trawls with large bobbins along the ground rope fished in water depths of 662 to 1,524 m in tropical New Zealand. These coral patches may require over 100 years to recover, and many may be crushed or overturned without coming to the surface in a net. Sampled benthic fauna over seamounts in

Tasmania were subject to varying levels of fishing effort. Substrates in heavily fished areas were predominantly bare rock or coral rubble and sand. Colonial corals and associated fauna were lacking. Species abundance and richness were also lower than in lightly fished areas. Observed differences in faunal composition and distribution on fished and un-fished seamounts off Tasmania concluded that although the depths of the seamounts differed, trawling was responsible for stripping coral cover from the fished features. The authors attribute these differences to fishing effort and recommend permanently closed areas to protect fragile seamount ecosystems.

In summary, only very limited chronic and immediate effects of bottom trawling were detected by these studies. Whereas these results are consistent with some reports for other shallow, sandy, and naturally disturbed areas, an unequivocal determination of negligible effect is not possible in this case. However, seamounts are widely recognized as areas of high productivity, and important commercial fisheries worldwide focus on these habitats because fish species form large aggregations in such areas.

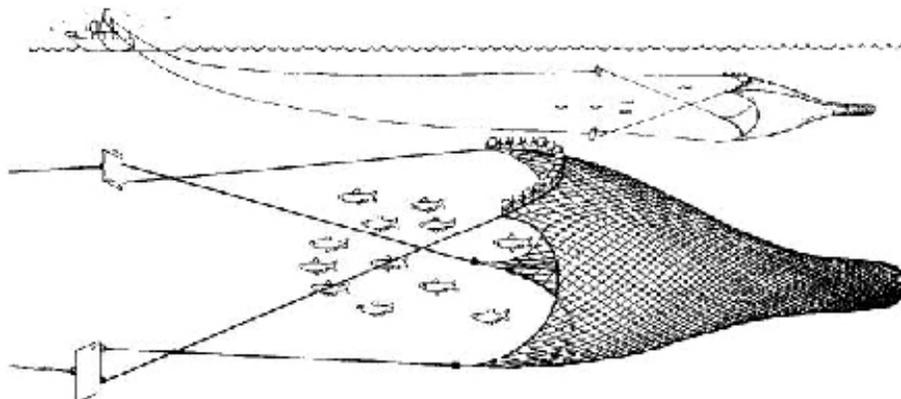
Reports of several relevant studies done recently in Alaska waters are in process and are expected to provide relevant and useful information on the effects of bottom trawling in this region:

- Bottom trawls commonly, but not always, cause detectable short-term changes in infauna, epifauna, megafauna and substrate in different habitat types.
- In comparable environments, studies using larger diameter footropes with non-continuous contact along their length, such as those used in Alaska, indicated less damage to upright, attached epifauna than those with smaller diameters and continuous contact.
- At higher trawling intensities, bottom trawling with large-diameter footropes can produce persistent changes in megafauna communities on naturally disturbed sandy substrates.
- Even at relatively high intensities (12 tows per year), effects on infaunal communities may be ephemeral on fine- to medium-grained sandy bottoms.
- Large bodied, attached, and emergent epifauna are particularly vulnerable to trawl damage, even by a single pass at un-impacted sites, and effects can remain for at least a year in Alaska waters.
- Specific effects on EFH will depend on the fine-scale distribution and intensity of fishing effort relative to habitat distribution, levels of natural variability relative to fishing effects, and the nature of habitat dependencies of managed fish stocks. These are poorly known for Alaska EFH. Given discrete but overlapping spatial distributions of species reflecting different habitat preferences/requirements, differential responses to fishing gear effects are likely. In general, the ecological implications of reported changes due to bottom trawling are poorly known, particularly as they relate to sustainable fishery production and healthy ecosystem function.

### **3.7.1.2 Pelagic Trawls**

Pelagic trawls are special types of trawls that are fished off the seabed. These trawls are typically much larger than bottom trawls, but the leading parts of the net are constructed of large meshes (more than one meter) for herding pelagic species into the trawl. The very large mesh openings greatly reduce hydrodynamic drag, so vessels can fish pelagic trawls that are much taller and wider than any bottom trawls they may use. These large meshes are required by law to allow for the escape of bycatch species that are not herded by these large meshes as easily as pollock, including halibut, sole, and crabs. Walleye pollock in the BSAI are caught exclusively by pelagic trawls, since nonpelagic trawling for pollock is prohibited. Pelagic trawls dominate the GOA pollock fishery and are sometimes used in rockfish

fisheries. Sea floor contact is discouraged by prohibiting devices that protect trawl footropes. In the BSAI, vessels fishing for pollock are also limited by a performance standard prohibiting vessels from having more than twenty crabs on board, which would be an indication of bottom trawling. The danger of trawl damage is likely to be effective in minimizing on-bottom trawling with pelagic trawl gear in areas of rough, hard, or complex substrates, but not necessarily in areas where significant obstructions are unlikely. Anecdotal evidence indicates that pelagic trawls are frequently fished on the bottom in areas with smooth floors. An indication of the distribution of such substrates in the eastern Bering Sea is that NMFS surveys the entire eastern Bering Sea shelf with a trawl whose footrope is as vulnerable as those of pelagic trawls; however, NMFS uses bobbin-protected footropes in the GOA and Aleutians because of the frequency of rough substrates.



**Figure 7. Schematic of pelagic trawling.**

Pelagic trawls fished off-bottom have no known effect on benthic EFH. While some pelagic habitats may be very important to fish species, the chemical and hydrological features that make them important are not subject to change by the passage of fishing gear because of the continuous/fluid nature of the environment.

Indirect and anecdotal evidence suggests that, in some seasons and areas, pollock are distributed so close to the seabed that they could not be caught effectively without putting some parts of pelagic trawls in contact with the sea floor. Confirmation that such near-bottom distributions can be widespread includes the following: a) in 5 out of 9 years that both acoustic and bottom trawl surveys were conducted in the eastern Bering Sea, the bottom trawl, which opens only 2 m high, detected more than 95% of the total biomass estimate for pollock more than two years old; and b) the average acoustic measurements of pollock density from those surveys were five times higher half a meter above the bottom than at 2 to 4 m. As such, there is a strong incentive for fishing pelagic pollock trawls near to or on the bottom.

The effects from pelagic gear being fished on the bottom have not been specifically studied, and there are some important differences from bottom trawls in ways that must be considered in assessing likely habitat impacts. Pelagic trawls used off Alaska are generally designed to fish downward, with the entire net fishing deeper in the water column than the doors. Pelagic doors are not designed to contact the sea floor. Pelagic trawls are pulled downward by weights attached to the lower wing ends, producing several hundred pounds of downward force. If the trawl is put in firm contact with the sea floor, most of this weight will be supported by the bottom, producing narrow scour tracks. Pelagic trawl footropes used in Alaska are most commonly made of steel chain, with some use of steel cable. Thus, their effects on habitat are more similar to tickler chains or small-diameter trawl footropes than to the large-diameter, bobbin-protected, footropes used in Alaska bottom trawls. Small footrope diameter will reduce the height that sediments are suspended into the water column, but make penetration of the sediment when bumps

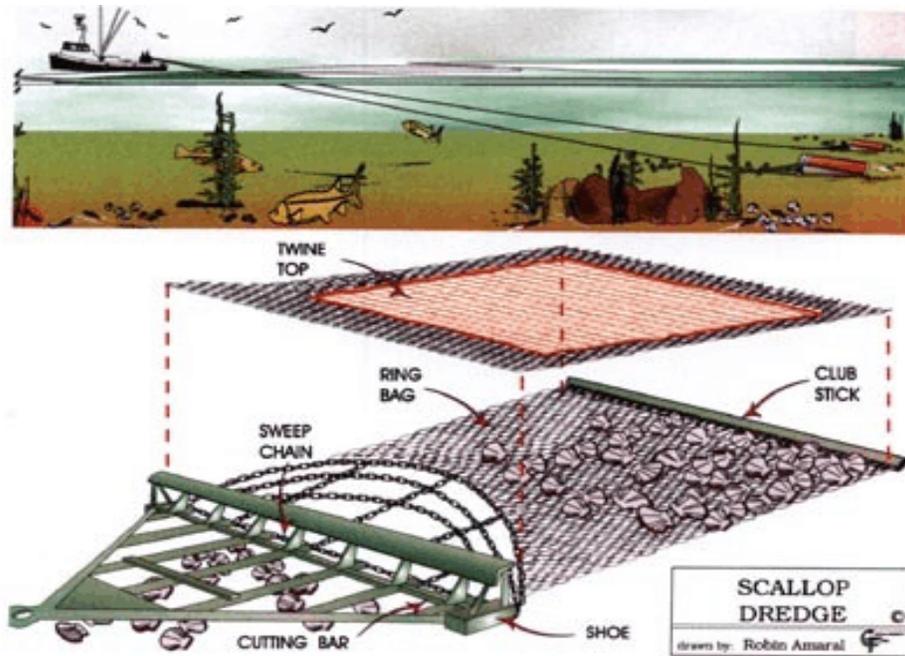
and ridges are encountered more likely. Animals anchored on or in the substrate would be vulnerable to damage or uprooting by this type of footrope. The very large mesh openings in the bottom panels of these trawls make it unlikely that animals not actively swimming upward in reaction to the net will be retained and hence removed from the sea floor, though they may be displaced a short distance or damaged in place.

In summary, pelagic trawls may be fished in contact with the sea floor, and there are times and places where there may be strong incentives to do so, for example, the eastern Bering Sea shelf during the summer. No data are available to estimate the frequency of this practice. Potential impacts would depend on the vulnerability of epibenthic animals in sand or mud substrates to contact with the small-diameter footropes. Prohibition of footrope protection makes the use and, hence, the impact of such gear on hard or rugged substrates unlikely.

### **3.7.1.3 Dredge Gear**

The Alaska weathervane scallop fishery is pursued using a standard “New Bedford style” scallop dredge. These dredges are heavy-framed devices with an attached holding bag, and they are towed along the surface of the seabed. The upper and forward part of the rectangular frame, or bail, is attached to the towing bar. The fixed opening in the frame is low in height relative to its width. Steel dredge “shoes” are welded onto both lower corners of the cutting bar, which is located at the bottom of the aft part of the frame. The dredge shoes bear most of the weight and act as “sled runners,” permitting the dredge to move easily along the substrate. Regulation requires that the trailing ring bag, which retains the catch, consists of 4 inch (inside-diameter) steel rings connected with steel links to allow undersized scallops to escape. Rubber chaffing gear may be used to protect the steel links and the integrity of the ring bag. The top of the bag consists of 6 inch stretched mesh polypropylene netting, known as the “twine back.” The mesh netting helps hold the bag open while it is dragged along the ocean floor. A club stick attached at the end of the bag helps maintain the shape of the bag and provides for an attachment point to dump the dredge contents on the deck. A sweep chain footrope sweeps back in an arc and is attached to the bottom of the mesh bag. The bottom of the bag was formerly attached directly to the lower bar of the frame, but most fishers believe that the dredge tends bottom better with the chain footrope rigging. Bottom tending is also assisted by a pressure plate, which is a length of steel attached along the width of the dredge and angled so that the water pressure passing over it creates a downward force on the dredge.

**SMOLOWITZ  
FIGURE 2  
(page 48)  
The New  
Bedford style  
scallop dredge,  
with top  
removed for  
illustration.  
Drawing by  
Robin Amaral.**



**Figure 8. Schematic of a scallop dredge, in the New Bedford style.**

When fishing properly, the dredge shoes, ring bag, and club stick maintain contact with the seabed. The side of the bail is designed so that the angle between the bail and the mouth of the dredge may be changed to suit bottom conditions. When the bottom is soft, the dredge is rigged so that the cutting bar (or scraper blade) will tend to ride up over the bottom and there will be less tendency for the dredge to become clogged with mud. The turbulence created by the cutting bar stirs the substrate and kicks up scallops into the ring bag. On harder bottoms, a different setting is used so that the dredge will dig in somewhat and catch more of the scallops in its path. In Alaska fisheries, however, the cutting bar is fixed and rides above the surface of the substrate. Tickler chains that run from side to side between the frame and the ring bag may also be used in harder areas or as an alternate fishing method when catch rates are low. If used on softer bottoms, the tickler chains will also stir up the substrate and kick scallops into the twine top. Rock chains that run from front to back are used in Atlantic scallop fisheries to keep larger rocks out of the ring bag, but are not used in Alaska.

Vessels used in the Alaska weathervane scallop fishery range in size from 58 to 124 feet length overall (LOA). The number of vessels is tightly limited, so vessels can be selective regarding the times and places that they fish. Those fishing inside the Cook Inlet Registration Area are limited to operating a single dredge not more than 6ft wide. Vessels fishing in the remainder of the state are limited to operating no more than two scallop dredges at one time, and each scallop dredge is limited to a maximum width of 15ft. Each dredge is attached to the boat by a single steel cable operated from a deck winch. On average, a 15ft New Bedford dredge weighs approximately 2,600 pounds, and a 6 foot dredge weighs about 900 pounds.

The magnitude and extent of seabed disturbances by scallop fishing vary according to the gear used and the habitats that are fished. For example, a worldwide trawl and dredge study for the submarine cable industry determined the depths to which various fishing gears penetrate the seabed. For normal fishing conditions, maximum cutting depths ranged from 40 mm for a New Bedford style dredge on sandy/rocky bottom to 300 mm for a mechanized (hydraulic) dredge on softer bottoms. Scallop dredges as a class penetrated less (40 to 150 mm) than beam trawls (60 to 300 mm) and bottom trawls and doors (50 to 300 mm). Box dredges that are used in shallow water European and Australian bivalve fisheries, some with

toothed cutting bars, penetrated up to 25 mm. Overall, lower values were associated with light gear and hard bottoms, while higher values resulted from heavier gears and softer bottoms. Even within a particular gear class, such as scallop dredges, there may be substantial differences in effects. For example, damage to non-captured scallops is reported to be significantly higher on rock substrate as compared to sand, perhaps due to crushing action of the dredge. Moreover, a panel of experts recently concluded that much of the scientific literature on benthic habitat effects is based on the European style dredge, which differs in structure and use from the New Bedford style dredge. The leading edge of the European dredge contains teeth which dig into the substrate. This type of gear is used by smaller vessels that cannot tow a non-toothed dredge fast enough (4 to 5 knots) to fish effectively. The panel noted that because of these differences, research using the European dredge was not very relevant to North American scallop fisheries or the habitats in which they are found, and should only be applied in a limited fashion. The fishing configuration is also an important consideration influencing seabed effects. Although spring-loaded scallop dredges used in Ireland may be relatively narrow (75 cm), some vessels tow as many as fourteen of these dredges simultaneously. For East Coast and most Alaskan scallop fisheries, two 15 foot New Bedford dredges are simultaneously towed from opposite sides of the vessel, effectively doubling the footprint for each tow.

The weathervane scallop fishery in Alaska occurs in limited, but well-defined areas of the GOA and the eastern Bering Sea. Based on an analysis of sediment properties associated with 28,000 individual dredge hauls for the period 1993 to 1997, Turk (2001) concluded that commercially fished beds occur most frequently on sand and sandy-silt in the GOA. Limited effort occurred in silty-clay substrates and in areas where bedrock and gravelly mud occurred, but was relatively high in sand, sandy to muddy gravel, gravelly sand, and clayey silt to silt substrates. These same data indicate commercial aggregations of scallops in the GOA occur over fairly narrow depth ranges from 25 to 195 m. The overall broad depth range was attributed to additional physical factors that were not investigated. The majority of fishing effort for all of Alaska occurs at 40 to 60 fathoms (73 to 110 m). Although there are some areas or portions of areas that contain rock (e.g., Alaska Peninsula Registration Area), the Alaska scallop fishery occurs primarily on soft-bottom areas because fishers avoid harder areas if possible, because of probable damage to their fishing gear.

Scallop dredges are designed to disturb the seabed in order to dislodge and capture scallops. The following summaries of scientific research detail physical effects on the sea floor and effects on living substrate such as benthic invertebrates. Generally, these studies discuss changes that occur as a result of scallop dredging, but do not interpret the ecological consequences of these changes.

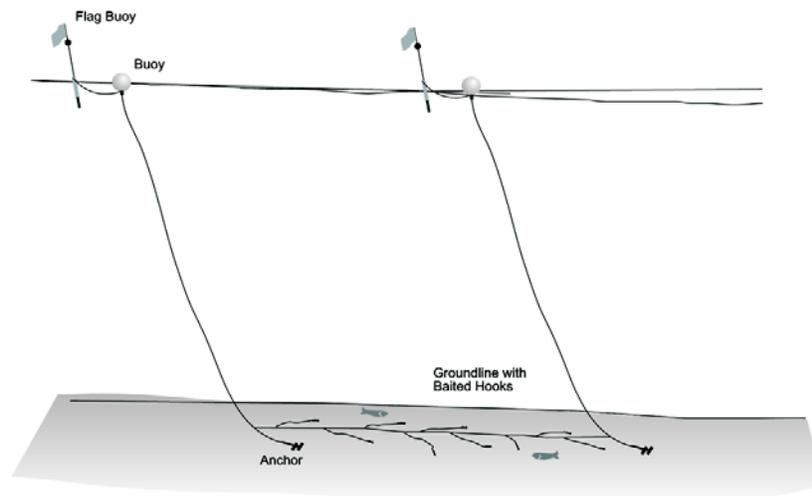
Sediment plumes generated by scallop dredging may cause burial, clog respiratory surfaces, and reduce light levels; they may also release heavy metals, nutrients, or toxic algal cysts. The magnitude and spatial extent of the suspended sediment field around any dredging operation are a function of the type of dredge used, the physical/biotic characteristics of the material being dredged (e.g., density, grain size, organic content), and site-specific hydrological conditions (e.g., currents, water body size/configuration). The rate of change of plume characteristics depends critically on suspended sediment grain sizes, current strength, and the related water column turbulence (Black and Parry 1999).

At least some of these reported effects can be considered unintentional bycatch by dredges that have inherently poor selection characteristics. Overall, dredge impact studies that are relevant to the Alaska fishery and environments, particularly those with a biological focus, are very limited. Similarly, although offshore scallop dredging has occurred on the sandy Scotian Shelf off eastern Canada since 1862, the thorough review of trawl and dredging impact literature did not include a single study from this area. Although there are obvious differences in the nature of trawls and scallop dredges, it is nevertheless reasonable under the circumstances to consider the results of bottom trawl studies in softer sediments,

including sand, as representative of the effects due to scallop dredging. In fact, dredge and trawl studies summarized in major reviews of the literature are frequently handled in this fashion.

#### 3.7.1.4 Longline (Hook and Line)

Demersal longlines consist of two buoy systems that are situated on each end of a mainline to which leaders (gangions) and hooks are attached. The groundline (or mainline), usually made of sinking line (more dense than water), can be several miles in length and have several thousand baited hooks attached. Small weights may be attached to the groundline at intervals. Below each buoyed end is a weight or an anchor. A vessel may set a number of lines, depending on the area, fishery, and site. The principal components of the longline that can contact the seabed are the anchors or weights, the hooks, the gangions (lines connecting the hooks to the groundline), and the groundline. This gear is used in both the GOA and BSAI cod and sablefish fisheries.



**Figure 9. Schematic of longlines gear (hook and line) set in the water.**

Longline gear in Alaska is fished on-bottom. In 1996, average mainline set length was 9 km for the sablefish fishery, 16 km for Pacific cod, and 7km for Greenland halibut; average hook spacing was 1.2 m for the sablefish fishery, 1.4 m for Pacific cod, and 1.3 m for Greenland halibut. The gear is baited by hand or by machine, with smaller boats generally baiting by hand and larger boats generally baiting by machine. Circle hooks usually are used, except for modified J-hooks on some boats with machine baiters. The gear usually is deployed from the vessel stern with the vessel traveling at 5 to 7 knots. Some vessels attach weights at intervals along the longline, especially on rough or steep bottom, so that the longline stays in place and lays on-bottom. Very little information exists regarding the effects of longlining on benthic habitat, and published literature is essentially nonexistent.

Observers on hook and line vessels have recorded bycatch of HAPC biota. Bycatches of benthic epifauna by Pacific cod fisheries using longline gear off Alaska were comparable to those using trawl gear. Bycatches of anemones and seawhips/pens were higher for longlines than trawls, while trawl bycatches were higher for corals and sponges. On a regional scale, these removals do not represent a large portion of the population. For example, anemone abundance on the eastern Bering Sea shelf, likely underestimated due to the sampling trawl not catching 100% of anemones in the trawl path, was estimated at 26,570,000 kg of which the three year (1997 to 1999) longline bycatch of 86,063 kg was at most 0.3%. A similar estimate for the Aleutian Islands area, where more of the hard substrates favored by anemones are available, could not be included because the trawl used for those surveys retains very few of the anemones in its path.

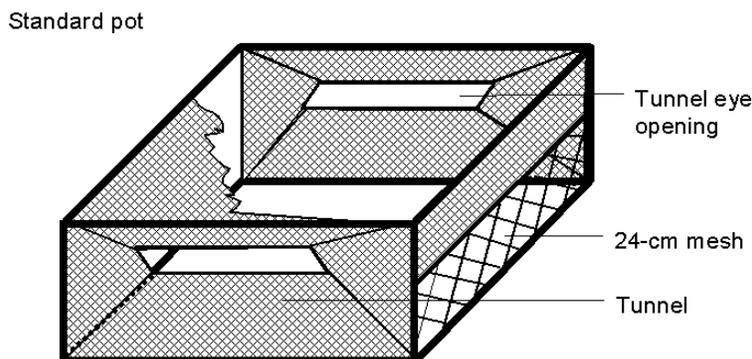
Observations of halibut gear made by NMFS scientists during submersible dives studying other aspects of longline gear off southeast Alaska provide some information on potential ways that longlines can affect bottom habitats. The following is a summary of these observations:

Setline gear often lies slack and meanders considerably along the bottom. During the retrieval process, the line sweeps the bottom for considerable distances before ascending. It snags on objects in its path, including rocks and corals. Smaller rocks are upended, hard corals are broken, and soft corals appear unaffected by the passing line. Invertebrates and other lightweight objects are dislodged and pass over or under the line. Fish, notably halibut, frequently moved the groundline numerous feet along the bottom and up into the water column during escape runs, disturbing objects in their path. This line motion was noted for distances of 50 feet or more on either side of the hooked fish.

These submersible observations only demonstrate the potential, and some mechanisms for, effects of longlines on benthic habitat, particularly structure-forming animals. Those observations are insufficient to assess whether habitats are significantly altered at either local or regional levels or whether they vary in fisheries that use different gear or methods (i.e., setting mainline under tension). Important missing information includes the area of sea floor affected by longlines, the proportion of animals in that area that are affected, the severity of effects, rates of recovery, and the importance of affected structures in the function of EFH.

### 3.7.1.5 Pot Gear

Pots are baited enclosures, usually with one-way entrances, that retain entering fish and crab. They are used in the GOA cod fishery, and in BSAI cod, brown king crab, red king crab, and sablefish and turbot fisheries. Pots used in the Alaska cod fishery are generally modified from the designs developed for the crab fishery, with the one-way entrances modified to account for differences in crab and cod behavior. The most common design is a rectangular frame approximately 2 x 2 x 1 m<sup>3</sup> made of welded steel rods with entrances on opposite walls. Because of solid steel construction, the pot weight (500 to 700 pounds) is not greatly reduced by immersion in water such that no additional anchors are required. Except in the Aleutians and certain months in the eastern Bering Sea, Alaska groundfish regulations require that each pot have its own buoyed line, so there are no underwater lines connecting adjacent pots (longlining). An exception to this is the deep-water golden king crab fishery in the Aleutian region, where the pots are longlined.



**Figure 10. Schematic of a crab or Pacific cod pot.**

Pots are considered to be less damaging than mobile gear, because they are stationary in nature, and thus, come into direct contact with a much smaller area of the sea floor. Pots affect habitat when they settle to the bottom and when they are hauled back to the surface, but single pots and pots connected in strings or longlines may also affect sea floor habitat when they are pulled along the sea floor. This would occur in

steeper terrain when wind and tide conditions dictated that gear be pulled upslope rather than to open water.

Physical damage from pots is highly dependent on habitat type. Sand and soft sediments are less likely to be affected, whereas reef-building corals, sponges, and gorgonians are more likely to be damaged because of their three-dimensional structure above the sea floor. Damage by pots also makes coral more susceptible to secondary infections.

The observed effects of pots set in water depths from approximately 14 to 23 m has covered a wide range of sediment types in Great Britain, including mud communities with sea pens, limestone slabs covered by sediment, large boulders interspersed with coarse sediment, and rock. Observations demonstrated that sea pens were able to recover fully from pot impact (left in place for 24 to 48 hours) within 72 to 144 hours of the pots being removed. Pots remained stationary on the sea floor, except in cases where insufficient line and large swells caused pots to bounce off the bottom. When pots were hauled back along the bottom, a track was left in the sediments, but abundances of organisms within that track were not affected. The authors did observe detached ascidians and sponges and damage to rose coral, but it was not clear if these resulted from this study or from previous damage. Authors concluded that no short-term effects result from the use of pots, even for sensitive species. The study did not examine chronic effects.

The pots used off Alaska are much larger and heavier than those in any of the studies cited. Except in the Aleutians and certain months in the eastern Bering Sea, Alaska groundfish regulations require that each pot have its own buoyed line, so there are no underwater lines connecting adjacent pots (longlining) which could be an additional source of effects. Little research has been conducted to date on their habitat effects. The area of sea floor contacted by each pot during retrieval is unknown and is expected to depend on vessel operations, weather, and current.

However, there is some evidence from submersible video transects conducted in the central AI that damage sustained to dense areas of coral and sponge habitat may have been caused by crab pots in contact with that habitat. Scientists observed elongated tracks where sessile epifauna had been removed or pushed and piled aside. Tracks were well delineated, straight, and about 3 m wide. Tracks did not appear to be consistent with damage observed from longlines or bottom trawl gear, nor that expected from submersible contact with the sea floor or landslides. There is still some uncertainty as to whether pot fishing was responsible for the damage, and the researchers are planning, pending the availability of research funds, to drag longlines of pots through the area to determine if they can replicate such tracks.

A large number of pots are lost in Alaska fisheries every year. Although pots might be considered less damaging to habitat than mobile gear, lost pots can have effects on populations of fish and crustaceans. Observed traps left out off the coast of Wales for 398 days were reported to have continued to collect fish for as long as they were left out, even though the bait was gone after 13 to 27 days. Derelict pots add vertical structure that is frequently colonized by sedentary invertebrates, altering the local environment. Alaska pot fisheries must install untreated biodegradable cotton twine in pot walls to eventually stop ghost fishing.

#### **3.7.1.6 Dinglebar (Troll) Gear**

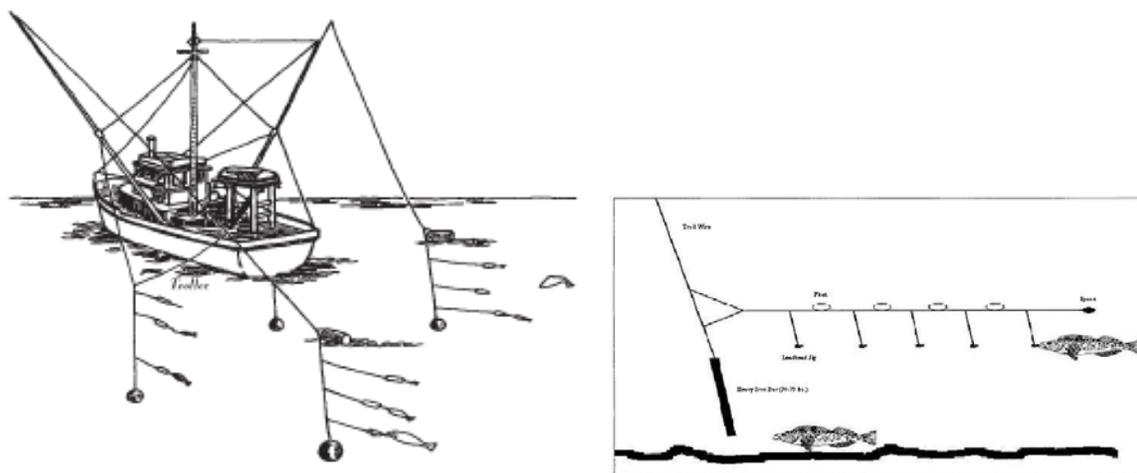
Troll vessels catch fish, typically salmon, or groundfish by moving lures or bait through the water column through feeding concentrations of fish. Two forms of trolling are legal, power troll and hand troll. The gear is typically comprised of four main wire lines that fish. They have a large lead sinker, referred to as a cannon ball, on the terminal end and 8-12 nylon leaders spaced out along its length, each of which ends in either a lure or baited hook. To retrieve hooked fish, the main lines are brought on board by hand or

power, and the fish can be gaffed when they are alongside the vessel. The leaders are then re-baited and let back down to the desired depth with the cannon ball.

Troll vessels come in a variety of sizes and configurations, ranging from small, hand troll skiffs to large, ocean-going power troll vessels of 50 ft or more in length. Troll fisherman operate throughout Southeast Alaska in both state and federal waters.

Dinglebar troll gear consists of a single line that is retrieved and set with a power or hand troll gurdy, with a terminally attached weight (a cannon ball at 12 pounds), from which one or more leaders with one or more lures or baited hooks are pulled through the water while a vessel is underway. Dinglebar troll gear is essentially the same as power or hand troll gear, the difference lies in the species targeted and the permit required. For example, dinglebar troll gear can be used in the directed fisheries for groundfish (e.g. cod) or halibut. These species may only be taken incidentally while fishing for salmon with power or hand troll gear. There is a directed fishery for ling cod in Southeast Alaska using dinglebar troll gear.

Trolling can occur over any bottom type and at almost any depths. Trollers work in shallower coastal waters; but may also fish off the coast, such as on the Fairweather Grounds. In most situations, the gear rarely contacts the ocean bottom.



**Figure 11. Schematics of troll and dinglebar gear.**  
Source: ADF&G.

### 3.7.1.7 Impacts on Habitat

The issues of primary concern with respect to the effects of fishing on the sea floor and benthic habitat are the potential for damage or removal of fragile biota within each area that are used by fish as spawning habitat and the potential reduction of habitat complexity, benthic biodiversity, and habitat suitability. Habitat complexity is a function of the structural components of the living and nonliving substrate and could be affected by a potential reduction in benthic diversity from long-lasting changes to the species mix. Many factors contribute to the intensity of these effects, including the type of gear used, the type of bottom, the frequency and intensity of natural disturbance cycles, and the history of fishing in an area.

In terms of habitat, the BSAI management area has complicated mixes of substrates, including a proportion of hard substrates (pebbles, cobbles, boulders, and rock), but data are not available to describe

the spatial distribution of all of these substrates. Therefore, it is difficult to assess habitat complexity in terms of specific substrates. Some information on vulnerable or fragile habitats can be surmised through the NMFS groundfish surveys or from anecdotal information provided by fishers who utilize these areas.

To estimate the potential effects of trawling over the skate egg concentration areas, the amount of recent trawl effort in these areas was examined. At least 50% of each site (not including Pribilof & Zhemchug, which were not fished) has been trawled over the 2003-2010 period, according to the CIA database. For this analysis, ArcGIS was used to buffer each VMS track line with 1/2 the net width figure from the EFH EIS. Those buffered lines were then joined and an area calculation performed. This area calculation represents the footprint of the fishery in these sites where a trawl net (area between doors) has passed over at least once, but does not account for multiple passes.

The Bering 2 site was the most heavily fished by both pelagic and non-pelagic trawls, with 80.5 and 91.6 % swept respectively. Bering 1, Bristol, and Pervenets were all fished extensively as well.

**Table 17. Trawl footprint analysis according to available VMS data, under Alternative 2.**

Source: NMFS HCD

HAPC Area	Total area (nm <sup>2</sup> )	NPT area Swept (nm <sup>2</sup> )	Percent (%) of NPT area swept	PTR area swept (nm <sup>2</sup> )	Percent (%) of PTR area swept
<b>1. Bering 1</b>	18.44	14.03	76.1	10.12	54.9
<b>2. Bering 2</b>	17.41	15.95	91.6	14.02	80.5
<b>3. Bristol</b>	13.81	0	0	7.95	57.6
<b>4. Pervenets</b>	27.66	17.96	64.9	19.46	70.4
<b>5. Pribilof</b>	1.09	0	0	0	0
<b>6. Zhemchug</b>	3.26	0	0	0	0

Due to the very small size and limited fishing effort in four of these six locations, adjacent areas will likely support the amount of fishing displaced if fishing activities and gear types that make contact with the sea floor were restricted. It is then possible to assume that some fishing grounds would be fished with more frequency, with the potential for increased direct impact. However, it is likely that the increased fishing effort in habitats currently fished would not be much greater than effort that already exists. The fleet may be displaced into areas with similar conditions for fishing, however, and not necessarily into areas that are more fragile or vulnerable (e.g., coral habitat). Because the maximum potential area closed to certain fishing activities under Options a through d of Alternative 3 is 225.8 nm<sup>2</sup>, the proposed action is not likely to result in any substantial changes to the current features of benthic habitat (other than skate egg EFH) including the habitat complexity, benthic diversity or habitat suitability.

Because there are no areas impacted, the effects of Alternatives 1 and 2 on habitat are the same, with Alternative 2 being slightly more protective of known skate egg deposition habitat. Therefore, any potential effects of Alternatives 1 and 2 on habitat are likely insignificant. The closure of these six areas may seem insignificant in relation to the vast areas open to fishing in the BSAI, and taking action to protect areas known or thought to contain sensitive marine habitats is a precautionary approach recognized in marine fisheries management and meets the management objectives of the FMPs (NMFS 2004). These areas of skate egg concentration are an example of vulnerable habitat that may be affected by fishing gear that makes contact with the sea floor. Under Alternative 3, a limit on fishing activities that make contact with the sea floor would result in a positive effect on habitat because fishing has already occurred there, and spawning habitat will likely be protected with limits on fishing gear that makes contact with the sea floor.

### 3.7.2 Target Species

Target species for the BSAI area are managed within the BSAI Groundfish FMP. The FMP describes the target fisheries as, “those species which are commercially important and for which a sufficient data base exists that allows each to be managed on its own biological merits.” Catch of each species must be recorded and reported. This category includes walleye pollock, Pacific cod, sablefish, yellowfin sole, Greenland turbot, arrowtooth flounder, rock sole, flathead sole, Alaska plaice, “other flatfish,” Pacific ocean perch, northern rockfish, shortraker rockfish, rougheye rockfish, “other rockfish,” Atka mackerel, sharks, skates, sculpins, octopus, and squid. Other non-groundfish targeted FMP species in Federal waters are crab and scallops. Regarding State-managed crab and invertebrates fisheries, no effects on these target species are expected because no fisheries for these species are prosecuted within the six areas of skate egg concentration under the alternatives and options.

The significance criteria used to evaluate the effects of this action on target species is below. These criteria are adopted from the significance criteria used in NMFS’ HAPC EA (2006).

**Table 18. Criteria used to estimate the significance of effects on FMP-managed target stocks.**

Effect	Criteria			
	Significantly Negative (-)	Insignificant (I)	Significantly Positive (+)	Unknown (U)
Stock Biomass: Potential for increasing and reducing stock size	Changes in fishing mortality are expected to jeopardize the ability of the stock to sustain itself at or above its MSST	Changes in fishing mortality are expected to maintain the stock’s ability to sustain itself above MSST	Changes in fishing mortality are expected to enhance the stocks ability to sustain itself at or above its MSST	Magnitude and/or direction of effects are unknown
Fishing mortality	Reasonably expected to jeopardize the capacity of the stock to yield sustainable biomass on a continuing basis.	Reasonably expected not to jeopardize the capacity of the stock to yield sustainable biomass on a continuing basis.	Action allows the stock to return to its unfished biomass.	Magnitude and/or direction of effects are unknown
Spatial or temporal distribution	Reasonably expected to adversely affect the distribution of harvested stocks either spatially or temporally such that it jeopardizes the ability of the stock to sustain itself.	Unlikely to affect the distribution of harvested stocks either spatially or temporally such that it has an effect on the ability of the stock to sustain itself.	Reasonably expected to positively affect the harvested stocks through spatial or temporal increases in abundance such that it enhances the ability of the stock to sustain itself.	Magnitude and/or direction of effects are unknown
Change in prey availability	Evidence that the action may lead to changed prey availability such that it jeopardizes the ability of the stock to sustain itself.	Evidence that the action will not lead to a change in prey availability such that it jeopardizes the ability of the stock to sustain itself.	Evidence that the action may result in a change in prey availability such that it enhances the ability of the stock to sustain itself.	Magnitude and/or direction of effects are unknown

It was determined within NMFS’ EFH EIS (2005) that considerable scientific uncertainty remains regarding the consequences of habitat changes for managed species. Nevertheless, the EIS analysis concluded that the effects on EFH from fishing target species are minimal because no indication exists that continued fishing at the current rate and intensity would alter the capacity of EFH to support healthy populations of managed species over the long term and no new information exists to the contrary. Therefore, Alternative 1, the no action or status quo alternative, is rated as insignificant for all target species in terms of stock biomass, fishing mortality, spatial and temporal distribution, and change in prey availability. If fish distribution remains the same as status quo, catch of target species is expected to remain the same under all alternatives and options; and no changes in stock biomass, fishing mortality,

and prey species availability would be anticipated under any of the alternatives or option. Similarly, under Alternative 2, fishing activity and distribution is expected to remain the same as status quo and the impact would be insignificant.

Under Alternative 3, prohibitions of certain fishing activities—particularly trawling—could result in a reduction in catch, though it would be expected that the fleet could make up foregone catch in other areas, adjacent or elsewhere. There may be additional impacts of Alternative 3 beyond what is provided by the quantitative analysis, and therefore the effects are unknown. Moving the fleet elsewhere to make up foregone catch could be problematic if vessels are required to fish outside of their preferred zone. Following is a description of public testimony on the implementation of gear prohibitions in the proposed HAPC sites. See Section 4.5.2, Additional Costs, for a more thorough discussion of additional potential socioeconomic effects from the impact of gear prohibitions within the areas of skate egg concentration.

### **3.7.2.1 Effects on skate population sustainability and abundance trends**

The Bering Sea and Aleutian Islands (BSAI) skate complex is managed in aggregate, with a single set of harvest specifications applied to the entire complex. In 2010, the North Pacific Fishery Management Council passed amendment 95 to the BSAI Fishery Management Plan, which removed skates from the Other Species complex and into the target category. Amendment 96 eliminated the Other Species complex and requires separate annual catch limits for its constituent species groups. Thus, BSAI skates are now managed as an independent complex with its own harvest specifications and annual catch limits (ACLs) are required for skates.

Harvest recommendations for Alaska skate (*Bathyraja parmifera*), the most abundant skate species in the BSAI, are made using the results of an age structured model and Tier 3. The remaining species (“other skates”) are managed under Tier 5 due to a lack of data. The Tier 3 and Tier 5 recommendations are combined to generate recommendations for the complex as a whole.

The Alaska skate makes up the vast majority of the skate complex biomass in the BSAI (greater than 90%). An age-structured model exists for Alaska skates, allowing Tier 3 harvest recommendations and the determination of its population status relative to  $B_{35\%}$  (a proxy for  $B_{MSY}$ ). In 2010 female spawning biomass for the Alaska skate was 55,755 t, relative to a  $B_{35\%}$  of 36,846 t. Alaska skate spawning biomass is thus substantially greater than the estimated limit of sustainability.

Reliable species-specific biomass estimates for these species have existed only since 2000 due to earlier difficulties with species identification. Total skate biomass in the BSAI has apparently increased since the early 1980s (Ormseth and Matta 2011). However this information should be evaluated with caution. Biomass estimates from the EBS shelf survey, which has been conducted in a consistent fashion over the same time period, suggest that total skate biomass has remained at approximately the same level (with some fluctuation) since a dramatic increase in the mid-1980s. The apparent increase over the 1980-2010 time period occurs mainly in the eastern Bering Sea slope and Aleutian Islands surveys. During this same period, those surveys have been irregular and survey methodology has changed over time. In addition skate species are long-lived (ranging from 20 years to 50 or more years), and a ten-year time series of abundance is too short to evaluate trends in population size. As a result it is difficult to interpret any apparent trends in skate biomass. See Appendix B – Color Figures 61-65 for recent trends in skate biomass (Ormseth and Matta 2011).

In the case of Alaska skates, survey biomass estimates, though variable, have been basically trendless since species identification began in 1999. Model estimates of spawning biomass have also basically been trendless over the 1992-2011 period covered by the most recent biomass estimation model, while total biomass has tended to increase fairly steadily at an average rate of about 0.7 % per year over the same

time period. Recruitment does not appear to vary much from year to year, with a CV for the time series of only 18 %. The most recent above-average year class was spawned in 2004. An examination of species-specific biomass estimates from 2000-2010 shows no apparent trend in abundances

There are a number of factors that hinder effective skate management and that strengthen the case for protecting areas of skate egg concentration as a mean of enhancing skate conservation:

- 1) For all skate species in the BSAI except for Alaska skate, life history data are nonexistent. A mortality rate of 0.1 (an average of estimates from other species in other locations) is assumed for making harvest recommendations. Other data considered essential for population assessment, including maturity-at-age and fecundity, are completely unknown. These factors increase the uncertainty regarding NMFS estimates of OFL and ABC for the skate complex.
- 2) Skates are demonstrably vulnerable to overfishing due to slow growth, delayed maturation rates, and low fecundity. This sharpens the need for cautious management.
- 3) NMFS currently does not have the ability to monitor skate catches at the species level, primarily due to difficulties in observer identification of skates to species. As a result, NMFS cannot evaluate standard metrics such as exploitation rates.

Under Alternative 1, the status quo or no action alternative, no environmental impacts would occur. Under Alternative 2, the Council would identify any of the proposed areas of skate egg concentration as HAPCs, but would not adopt any gear type prohibitions or restrict any fishing activities. Therefore, the effects of Alternative 2 are expected to be the same as for the no action alternative.

Alternative 3 and Options a – e would prohibit any fishing gear from making contact with the sea floor. This proposed HAPC action provides a means of enhancing conservation for a group of species for which the conventional groundfish management approach, though useful, has several shortcomings. Adult skates appear capable of significant mobility in response to general habitat changes, but any effects on the small scale area of skate egg concentration crucial to reproduction could have disproportionate population effects. Eggs are mostly limited to isolated areas of skate egg concentration, and juveniles use different habitats than adults. Changes in these habitats have not been monitored historically, so assessments of habitat quality and its trends are not currently available. The stock assessment authors have recommended continued study of areas of skate egg concentration to evaluate their importance to population production. After hatching, juveniles most likely remain in continental shelf and slope waters, but specific distribution is unknown; adults are found across wide areas of the shelf and slope. The proposed action is designed to protect the reproductive output of skates, thereby increasing the likelihood that young skates will recruit to the adult population and enhancing the conservation of skate populations.

### **3.7.2.2 Impacts on skate eggs**

The direct impact on skate egg cases from fishing gear has not yet been investigated. Components of bottom trawl gear that would be in direct contact with an egg case are those in direct contact with the sea floor and include the doors, sweep, footrope, and net. Bottom trawl doors are heavy (exceeding 1,000 lbs.) and are designed to contact the sea floor riding on the door's edge or shoe. A door shoe width generally ranges from 4 to 12 feet wide. Therefore, impact from the shoe would likely cause injury. However, the width of door shoes is rather minimal. The sweeps have potential to directly injure an egg case and are more likely to dislodge or roll over cases. Note that current regulations require elevating devices on sweeps and the only contact is on the bobbins spaced approximately 60 feet apart. The foot rope impact is similar to the sweep, except it is heavier overall and meant to skim the sea floor and

designed to catch fish. Thus, egg cases directly contacted by the footrope may be dislodged, rolled over, or pushed down-upon.

The net itself can also recruit egg cases and cases are then considered bycatch. Skate egg cases can entangle on the outside of the net with edge *horns*<sup>13</sup>, if present. Thus, entangled cases could be dislodged or ‘ride-along’ the net, to then be re-distributed within or outside of the area of skate egg concentration. Cases caught in the net are subject to pressures created by fish concentrating in the cod end. It is unknown how much pressure would cause direct impact to the embryo. Further, egg cases caught by the net, brought aboard, and then subsequently rolled-up onto the net reel are crushed and results in mortality.

What is known is that egg cases themselves are robust capsules. Gear coming in contact with an egg case could dislodge, roll over, settle the case further in sediments, injure or increase risk of mortality. Given the gear, when towed, has lift supplied by the tow vessel and some buoyancy and that skate egg cases are most often in softer substrates, the potential to physically cause injury to the case exists, however the extend of these effects remains unknown. The table below predicts the impacts of the different gear prohibitions under Alternative 3. Under Alternative 1, the status quo or no action alternative, there are no expected environmental impacts. Under Alternative 2, the Council would identify any of the proposed areas of skate egg concentration as HAPCs, but would not adopt any gear type prohibitions or restrict any fishing activities. Therefore, the effects of Alternative 2 are expected to be the same as for the no action alternative.

**Table 19. Expected impacts on skate eggs of the options under Alternative 3**

<b>Option under Alternative 3</b>	<b>Gear type prohibition</b>	<b>Expected environmental impacts</b>
<b>Option a</b>	Nonpelagic trawl (bottom trawl), dredge, and dinglebar	Skate eggs protected from potential impacts of nonpelagic (bottom) trawls in sites selected.
<b>Option b</b>	Pelagic trawl, nonpelagic trawl, dredge, and dinglebar	Skate eggs protected from potential impacts of nonpelagic trawls and pelagic trawls in sites selected.
<b>Option c</b>	Nonpelagic trawl, dredge, dinglebar, po, and hook and line (longline)	Skate eggs protected from potential impacts of nonpelagic trawls in sites selected.
<b>Option d</b>	nonpelagic trawl, pelagic trawl, dredge, dinglebar, pot, and hook and line	Skate eggs protected from potential impacts of nonpelagic trawls and pelagic trawls in sites selected.

<sup>13</sup> *Horns* are hook-like extensions located on the posterior and anterior corners of the egg case and thought to help anchor the case in sediment. Horn presence and size varies between species.

**Table 20. Summary table of potential impacts of fishing gear on skate eggs**  
Source: NPFMC.

<b>Gear type</b>	<b>Exposure</b>	<b>Potential Impacts on skate eggs</b>	<b>Summary</b>
<b>Nonpelagic trawl (bottom trawl)</b>	Low effort at Bering 1, Pervenets; medium effort at Bering 2	Unknown, but possible dispersal of egg cases, unobserved mortality due to gear impacts, silting from sweeps and footropes, bycatch mortality	Bottom trawls could potentially impact skate egg concentrations at exposed sites.
<b>Pelagic trawl</b>	Low effort at Bering 1, Bristol; medium effort at Bering 2, Pervenets	Unknown, but possible dispersal of egg cases entangled in netting when net fished on bottom	Pelagic trawls could potentially impact skate egg concentrations at exposed sites.
<b>Dredge</b>	None	Unknown, but possible dispersal of egg cases, unobserved mortality due to gear impacts, silting due to dredging, bycatch mortality	Scallop dredges have no impact on these skate egg concentration sites.
<b>Pot</b>	None for groundfish; low effort for crab	Unknown, but possible unobserved mortality if pot lands on egg cases	Pot gear likely has almost no impact on these skate egg sites.
<b>Hook and line (longline)</b>	Low effort at Bristol, Pervenets, Zhemchug, Pribilof; Medium effort at Bering 1	Unknown, but possible dispersal of egg cases if tangled in line	Longline gear likely has almost no impact on these skate egg concentration sites.
<b>Dinglebar</b>	None	Unknown, but possible observed mortality if weght encounters an egg case	Dinglebar gear is not used in the BSAI and thus no impacts on these sites.

### 3.7.1 Non-Target Resources

Non-target resources include groundfish species taken as bycatch in the targeted Atka mackerel, Pacific Ocean perch, and Pacific cod fisheries, prohibited species, non-specified species and forage fish. Retention of prohibited species (PSC) is forbidden in the BSAI fisheries. The prohibited species include: Pacific salmon, steelhead trout, Pacific halibut, Pacific herring, and Alaska king, Tanner, and snow crab. Pacific salmon include Endangered Species Act (ESA)-listed salmon that may occur in the BSAI. Pacific salmon are primarily taken in the eastern Bering Sea pollock fishery; very few Pacific salmon are taken in the AI. No change in potential takes of ESA-listed salmon is expected with this action, because of the proposed action gear type, fishery locations, small areas, and no changes in overall harvest levels.

Management measures are currently in 50 CFR 679.21 to reduce the potential for incidental take of PSC species. These measures include limits on the take of certain PSC species and closures of areas to protect places where PSC species may occur. At present no active management and only limited monitoring of species in the other species and non-specified species occurs. Most of these animals are not currently considered commercially important and are not targeted or retained in groundfish fisheries. The information available for non-specified species is much more limited than that available for target fish species. Directed fishing for forage fish species is prohibited and most of the bycatch of these occur in the pollock pelagic trawl fishery.

The significance criteria used in the 2006-2007 Groundfish Harvest Specifications EA/RIRs for non-specified species is applicable to this analysis of the effects on non-target species (NMFS 2006a). This EA/RIR provided the latest ideas on determining the significance of effects on non-target species from the groundfish fisheries considering the lack of data regarding biomass and sustainability of most non-target species. The first criterium in the table was further refined for this analysis from NMFS 2006a to clearly

provide a criterium for “insignificant impact” and to be consistent with other analyses of environmental components in this EA/RIR/IRFA. This analysis and the 2006-2007 EA/RIR analyze the effects of groundfish fisheries on non-target resources in the AI with this proposed action being much narrower in focus.

The proportion of non-target species (non-specified, forage fish, and PSC) removed would be very small in relationship to the entire management area. In terms of bycatch of non-target species, it not expected that any negative incremental changes will occur from Alternative 3 because the amount of effort in these sites is low. Under all alternatives, the total harvest or target species and associated PSC are expected to be the same because fishing would likely be nearby, and thus have similar PSC catch rates. Because the groundfish harvest is not expected to increase, the harvest of non-specific, PSC species and forage species are also not expected to increase and no change in the sustainability of non-target species biomass is expected. Therefore the effects of Alternative 3 are expected to be the same and to be insignificant.

**Table 21. Criteria used to estimate the significance of effects on forage and non-specified species**

Insignificant impact	The fishery would have insignificant impact on non-specified fish stocks if it did not change sustainable non-target species biomass.
Adverse impact	A substantial reduction in the sustainable biomass of non-target species stocks would be an adverse impact.
Beneficial impact	An increase in stocks above the levels they would reach in the absence of the fishery (perhaps due to the harvest of groundfish that compete for non-specified species prey) would be a beneficial impact.
Significantly adverse impact	Non-target species bycatches that were not consistent with sustainable non-specified species populations would be a significantly adverse impact. For the purpose of this analysis, the bycatch of non-target species will be assumed to be proportional to the sum of fishery TACs. A 50% increase in the harvest of target species from the baseline level is used as a proxy for an adverse significant threshold for non-target species
Significantly beneficial impact	No benchmark is available for a significantly beneficial impact, and this is not defined in this instance.
Unknown impact	Insufficient information available to predict target fish harvest change.

**Table 22. Criteria used to estimate the significance of impacts on prohibited species**

	Halibut	Herring	Salmon and Steelhead	Crab
No impact	No incidental take of the prohibited species in question.			
Adverse impact	There are incidental takes of the prohibited species in question			
Beneficial impact	Natural at-sea mortality of the prohibited species in question would be reduced – perhaps by the harvest of a predator or by the harvest of a species that competes for prey.			
Significantly adverse impact	Fisheries are subject to operational constraints under PSC management measures. Groundfish fisheries without the PSC management measures would be a significantly adverse effect.			
Significantly beneficial impact	No benchmarks are available for significantly beneficial impact of the groundfish fishery on the prohibited species, and significantly beneficial impacts are not defined for these species.			
Unknown impact	Not applicable			

Under Alternative 1, the status quo or no action alternative, no environmental impacts would occur. Under Alternative 2, the Council would identify any of the proposed areas of skate egg concentration as HAPCs, but would not adopt any gear type prohibitions or restrict any fishing activities. Therefore, the effects of Alternative 2 are expected to be the same as for the no action alternative.

### 3.7.2 Marine Mammals and Seabirds

Impacts of the proposed Federal action on marine mammals and seabirds may be a concern because they may be listed as endangered or threatened under the ESA, they may be protected under the Marine Mammal Protection Act (MMPA), they may be candidates or being considered as candidates for ESA listings, their populations may be declining in a manner of concern to State or federal agencies, they may experience large bycatch or other mortality related to fishing activities, or they may be particularly vulnerable to direct or indirect adverse effects from some fishing activities. These species have been given various levels of protection under the current FMPs of the Council, and are the subjects of continuing research and monitoring to further define the nature and extent of fishery impacts on these species. A current description of ESA consultations for each species is contained in section 3.4 of the harvest specifications EIS (NMFS 2007).

**Table 23. ESA listed and candidate species that range into the BSAI groundfish management area.**

Common Name	Scientific Name	ESA Status
Blue Whale	<i>Balaenoptera musculus</i>	Endangered
Bowhead Whale	<i>Balaena mysticetus</i>	Endangered
Fin Whale	<i>Balaenoptera physalus</i>	Endangered
Humpback Whale	<i>Megaptera novaeangliae</i>	Endangered
Right Whale <sup>1</sup>	<i>Balaena glacialis</i>	Endangered
Sei Whale	<i>Balaenoptera borealis</i>	Endangered
Sperm Whale	<i>Physeter macrocephalus</i>	Endangered
Steller Sea Lion (Western Population)	<i>Eumetopias jubatus</i>	Endangered
Steller Sea Lion (Eastern Population)	<i>Eumetopias jubatus</i>	Threatened
Chinook Salmon (Lower Columbia R.)	<i>Oncorhynchus tshawytscha</i>	Threatened
Chinook Salmon (Upper Columbia R. Spring)	<i>Oncorhynchus tshawytscha</i>	Endangered
Chinook Salmon (Upper Willamette)	<i>Oncorhynchus tshawytscha</i>	Threatened
Chinook Salmon (Snake River spring/summer)	<i>Oncorhynchus tshawytscha</i>	Threatened
Chum Salmon (Hood Canal Summer run)	<i>Oncorhynchus keta</i>	Threatened
Coho Salmon (Lower Columbia R.)	<i>Oncorhynchus kisutch</i>	Threatened
Steelhead (Snake River Basin)	<i>Oncorhynchus mykiss</i>	Threatened
Steller's Eider <sup>2</sup>	<i>Polysticta stelleri</i>	Threatened
Short-tailed Albatross <sup>2</sup>	<i>Phoebastria albatrus</i>	Endangered
Spectacled Eider <sup>2</sup>	<i>Somateria fishcheri</i>	Threatened
Kittlitz's Murrelet <sup>2</sup>	<i>Brachyramphus brevirostris</i>	Candidate
Northern Sea	<i>Enhydra lutris</i>	Threatened

<sup>1</sup>NMFS designated critical habitat for the northern right whale on July 6, 2006 (71 FR 38277).

<sup>2</sup>The Steller's eider, short-tailed albatross, spectacled eider, Kittlitz's murrelet, and Northern sea are species under the jurisdiction of the USFWS. For the bird species, critical habitat has been established for the Steller's eider (66 FR 8850, February 2, 2001) and for the spectacled eider (66 FR 9146, February 6, 2001). The Kittlitz's murrelet has been proposed as a candidate species by the USFWS (69 FR 24875, May 4, 2004).

Many measures are already in place to protect marine mammals and seabirds from potential adverse effects from fishing activities. These measures include seasonal and geographic closed areas, requirements for seabird avoidance devices, observer requirements, and voluntary industry research activities to reduce vessel and gear encounters with protected species. These measures will remain in place in the future. And as new knowledge becomes available to minimize adverse impacts of fishing

activities on protected species, the Council and NMFS likely will consider employing additional or modified measures to further reduce adverse effects on seabirds and marine mammals.

Assumed in this analysis is the global potential for fuel spills, other accidental contaminant releases, and accidental loss of fishing gear (nets, lines, buoys, pots or traps, hooks) from fishing activities throughout the North Pacific. Much of this lost gear or released contaminants disperse in the ocean, settle to the sea floor, or wash up on shore along the Alaskan or other coastlines. Some of the lost gear may entangle with marine mammals or birds, and this is further discussed below. Some contaminants may contact swimming fish, mammals, or birds and be absorbed by animal tissues. While these instances of contamination are most likely not lethal, some mortalities may occur to these species that are unseen and undocumented. Vessel strikes of mammals and sea birds also may occur and be either unknown to the vessel operator or unreported. Thus there likely are some unrecorded mortalities to marine mammals and seabirds from ship strikes, but Angliss and Lodge (2002) note that the mortality levels from such instances can only be estimated. They have made some attempts to estimate a minimum mortality level to marine mammals from vessel strikes where possible. It is likely that strikes are few in number and have little effect on overall animal populations in the North Pacific. To summarize, these elements of fishing activities cannot be quantified to the extent necessary to be evaluated in any one fishery, region, or season, but are considered here generally and recognized as a byproduct of commercial fishing in the North Pacific. Because this action is limited in scope and intensity to a few small areas, substantial displacement of vessel activity is not anticipated. Thus the effects of all alternatives are expected to be insignificant.

#### **3.7.2.1 Marine mammals**

Direct and indirect interactions between marine mammals and groundfish harvest activity may occur due to overlap of groundfish fishery activities and marine mammal habitat. Fishing activities may either directly take marine mammals through injury, death, or disturbance, or indirectly affect these animals by removing prey items important for growth and nutrition or cause sufficient disturbance that marine mammals avoid or abandon important habitat. Fishing also may result in loss or discard of fishing nets, line, etc. that may ultimately entangle marine mammals causing injury or death. Because of the gear type, fisheries, and discrete location of the action and limited harvest, most marine mammals are not likely to be affected by the action. None of the alternatives would not change the implementation of the Steller sea lion protection measures, and therefore would not affect Steller sea lions or their designated critical habitat beyond those effects already analyzed in previous consultations (NMFS 2010). Harvest of prey species would be similar under both alternatives.

**Table 24. Criteria for determining significance of impacts to marine mammals**

	Incidental take and entanglement in marine debris	Harvest of prey species	Disturbance
Adverse impact	Mammals are taken incidentally to fishing operations, or become entangled in marine debris	Fisheries reduce the availability of marine mammal prey.	Fishing operations disturb marine mammals
Beneficial impact	There is no beneficial impact.	There are no beneficial impacts.	There is no beneficial impact.
Insignificant impact	No substantial change in incidental take by fishing operations, or in entanglement in marine debris	No substantial change in competition for key marine mammal prey species by the fishery.	No substantial change in disturbance of mammals.
Significantly adverse impact	Incidental take is more than PBR or is considered major in relation to estimated population when PBR is undefined.	Competition for key prey species likely to constrain foraging success of marine mammal species causing population decline.	Disturbance of mammal or such that population is likely to decrease.
Significantly beneficial impact	Not applicable	Not applicable	Not applicable
Unknown impact	Insufficient information available on take rates	Insufficient information as to what constitutes a key area or important time of year	Insufficient information as to what constitutes disturbance.

### 3.7.2.2 Seabirds

Given the sparse information, it is not likely that groundfish fishery effects on most individual bird species are discernible. For reasons explained in previous Steller Sea Lion Protection Measures SEIS (NMFS 2001), the following species or species groups may be considered possible receptors of fishing activity impacts: northern fulmar, short-tailed albatross, spectacled and Steller’s eiders, other albatrosses and shearwaters, piscivorous seabird species, and all other seabird species. Most of these effects are the incidental takes of these species by hook-and-line fisheries. Fishery-related processing waste and offal may also affect seabirds. ESA listed seabirds are under the jurisdiction of the USFWS. Past BiOps (2003) for the groundfish fisheries and the setting of annual harvest specifications. Both BiOps concluded that the groundfish fisheries and the annual setting of harvest specifications were unlikely to cause the jeopardy of extinction or adverse modification or destruction of critical habitat for ESA listed seabirds.

The seabird species most likely to be impacted by any indirect gear effects on the benthos would be diving sea ducks, such as eiders and scoters, and cormorants and guillemots (NMFS 2004). Additional impacts from nonpelagic (bottom trawling) could occur, if sand lance habitat is adversely impacted. This would affect a wider array of piscivorous seabirds that feed on sand lance, particularly during the breeding season, when this forage fish is also used for feeding chicks. Bottom trawl gear has the greatest potential to indirectly affect seabirds via their habitat. It is anticipated there would be an insignificant impact on seabirds based on the small amount of fishing effort (SE: wants to see how much fishing effort) in the four northern areas of the eastern Bering Sea. Because the proposed action involves small discrete areas with small fishing effort, the impacts are not likely to lead to population level effects on the prey from benthic habitat, other prey availability or incidental takes. Further, any redistribution of effort due to these closures would be expected to be minimal and mostly occur in areas adjacent to the closure areas. Therefore, Alternatives 2 and 3 have insignificant impacts on seabirds.

**Table 25. Criteria used to determine significance of impacts on seabirds**

	<b>Incidental take</b>	<b>Prey availability</b>	<b>Benthic habitat</b>
Insignificant	No substantive change in bycatch of seabirds during the operation of fishing gear.	No substantive change in forage available to seabird populations.	No substantive change in gear impact on benthic habitat used by seabirds for foraging.
Adverse impact	Non-zero take of seabirds by fishing gear.	Reduction in forage fish populations, or the availability of forage fish, to seabird populations.	Gear contact with benthic habitat used by benthic feeding seabirds reduces amount or availability of prey.
Beneficial impact	No beneficial impact can be identified.	Availability of offal from fishing operations or plants may provide additional, readily accessible, sources of food.	No beneficial impact can be identified.
Significantly adverse impact	Trawl and hook-and-line take levels increase substantially from the baseline level, or level of take is likely to have population level impact on species.	Food availability decreased substantially from baseline such that seabird population level survival or reproduction success is likely to decrease.	Impact to benthic habitat decreases seabird prey base substantially from baseline such that seabird population level survival or reproductive success is likely to decrease. (ESA listed eider impacts may be evaluated at the population level).
Significantly beneficial impact	No threshold can be identified.	Food availability increased substantially from baseline such that seabird population level survival or reproduction success is likely to increase.	No threshold can be identified.
Unknown impacts	Insufficient information available on take rates or population levels.	Insufficient information available on abundance of key prey species or the scope of fishery impacts on prey.	Insufficient information available on the scope or mechanism of benthic habitat impacts on food web.

### 3.7.3 Ecosystem

The proposed action could affect the marine ecosystem through removals of fish biomass or alteration of the habitat. Three primary means of measurement of ecosystem change are evaluated here: predator-prey relationships, energy flow and balance, and ecosystem diversity. The reference point for predator-prey relationships against which the criteria are compared are fishery induced changes outside the natural level of abundance or variability for a prey species relative to predator demands. The reference point for energy flow and balance will be based on bottom gear effort (qualitative measure of unobserved gear mortality particularly on bottom organisms) and a quantitative assessment of trends in retained catch levels over time in the area. The reference point for ecosystem diversity will be a qualitative assessment whether removals of one or more species (target, non-target) affects overall species or functional diversity of the area.

Fisheries can remove predators, prey, or competitors and thus alter predator-prey relationships relative to an un-fished system. Fishing has the potential to impact food webs, but each ecosystem must be examined to determine how important the potential impacts to the food webs are for that ecosystem. A review of fishing impacts to marine ecosystems and food webs of the North Pacific under the status quo and other alternative management regimes was provided in the programmatic groundfish SEIS (NMFS 2004).

Fishing may alter the amount and flow of energy in an ecosystem by removing energy and altering energetic pathways through the return of discards and fish processing offal back into the sea. From an ecosystem point of view, total fishing removals are a small proportion of the total system energy budget and are small relative to internal sources of inter-annual variability in production.

Fishing can alter different measures of diversity. Species level diversity, or the number of species, can be altered if fishing removes a species from the system. Fishing can alter functional or trophic diversity if it selectively removes a trophic guild member and changes the way biomass is distributed within a trophic guild. Fishing can alter genetic level diversity by selectively removing faster growing fish or removing spawning aggregations that might have different genetic characteristics than other spawning aggregations. Large, old fishes may be more heterozygous (i.e., have more genetic differences or diversity) and some stock structures may have a genetic component, thus one would expect a decline in genetic diversity due to heavy exploitation.

**Predator-Prey Relationships**– No effect on predator prey relationships is expected for Alternative 2 or 3. No substantial changes would be anticipated in biomass or numbers in prey populations, nor would there be an increase in the catch of higher trophic levels, or the risk of exotic species introductions. No large changes would be expected in species composition in the ecosystem. The trophic level of the catch would not be much different from the status quo, and little change would be expected in the species composition of the groundfish community, or in the removal of top predators. All alternatives would likely have the same insignificant effects on predator-prey relationships because of the small spatial difference between the alternatives and the same types of species and amounts expected to be harvested.

**Energy Flow and Balance** – The amount and flow of energy in the ecosystem would be the same as the status quo with regard to the total level of catch biomass removals from groundfish fisheries. No substantial changes in groundfish catch or discarding would be expected. Therefore the effects on energy flow and balance under all alternatives are the same and insignificant.

**Table 26. Significance thresholds for fishery induced effects on ecosystem attributes**

Effect	Criteria			
	Significantly Negative (-)	Insignificant (I)	Significantly Positive (+)	Unknown (U)
Predator-prey relationships	A decline outside of the natural level of abundance or variability for a prey species relative to predator demands.	No observed changes outside the natural level of abundance or variability for a prey species relative to predator demands	Increases of abundance or variability for a prey species relative to predator demands	Magnitude and/or direction of effects are unknown
Energy flow and balance:	Long-term changes in system biomass, respiration, production or energy cycling, due to removals.	No observed changes in system biomass, respiration, production or energy cycling, due to removals.	Increases in system biomass, respiration, production or energy cycling, due to lack of removals.	Magnitude and/or direction of effects are unknown
Ecosystem Diversity	Removals from area decreases either species diversity or the functional diversity outside the range of natural variability. Or loss in one or more genetic components of a stock that would cause the stock biomass to fall below minimum biologically acceptable limits	No observed changes outside the natural level for species diversity, functional diversity or genetic components of a stock.	Non-removal from the area increases the species diversity or functional diversity or improves the genetic components of a stock.	Magnitude and/or direction of effects are unknown

### 3.8 Economic and Socioeconomic Aspects of Federally Managed Fisheries

No significance determination is required for this component of the analysis. The reference point against which the alternatives and options were evaluated was the current economic and socioeconomic conditions from the current eastern Bering Sea federal fisheries. A thorough discussion of the socioeconomic effects of this proposed action is included in Section 5, the IRFA, of this analysis.

Economic impact would only be expected with the adoption of the gear prohibition options (a-d) under Alternative 3. The most extreme and economically impacting option, Option e, would close the areas of skate egg concentration to all fishing gears. If applied to all six sites proposed as HAPCs, the area impacted would encompass 225.8 nm<sup>2</sup>.

Limited impacts to longline fisheries may occur if closures are implemented. Effort data indicate that several of these areas are used, although not heavily, to target Pacific cod, and perhaps Greenland turbot. No impacts would be expected for pot gear targeting Pacific cod, or scallop fisheries using dredge gear, as none of these areas have been used in recent years. The effect of Alternative 3 on crab fisheries (pot gear) remains unquantified at this time. However, these areas are generally deeper (156-380 m) than the depths at which *C.opilio* (120 to 160 m or 60 to 80 fathoms), Tanner, and blue king crab are fished, but not as deep as brown king crab (400 m or 200 fathoms), which is at waters deeper than any skate site. However, in some years *C.opilio* has been fished to 240 m (or 120 fathoms), which could have the potential to overlap a few skate sites.

Trawl fisheries would also be impacted, but these impacts are considered likely to be minimal. Analysis suggests that, on average, a closure to pelagic and bottom trawling of these sites would result in maximum foregone gross revenues of **\$1,599,571** per year. Of this total, pelagic trawling for pollock in the HAPC areas could generate foregone gross revenues of **\$1,102,109** per year, and bottom trawling gross receipts of **\$497,461** per year (the total ex-vessel price divided by the nine years (2003 to 2011) of catch data examined). It would be expected that the fleet could make up this foregone catch in other areas, adjacent or elsewhere, though moving the fleet elsewhere to make up foregone catch could cause increased operation costs and may require vessels to fish outside of their preferred zone. A review of older data (1990 to 2005) suggests that the Bering 2 site may have been important to the pollock fishery. See Appendix B – Color Figure 35 and section 4.5.2, Additional Costs, for a more detailed discussion on potential costs associated with displacing the fleet.

### 3.9 Cumulative Impacts

Analysis of the potential cumulative effects of a proposed action and its alternatives is a requirement of NEPA. An environmental assessment or environmental impact statement must consider cumulative effects when determining whether an action significantly affects environmental quality. The Council on Environmental Quality (CEQ) regulations for implementing NEPA defines cumulative effects as:

The impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

This section analyzed the cumulative effects of the action considered in this environmental assessment. A cumulative effects analysis includes the effects of past, present and reasonably foreseeable future action (RFFA). The past and present actions are described in several documents and are adopted by reference. These include the PSEIS (2004), the EFH EIS (2005) and the harvest specifications EIS and most recent

BSAI groundfish harvest specifications (2011). This analysis provides a brief review of the RFFA that may affect environmental quality and result in cumulative effects. Future effects include harvest of federally managed fish species and current habitat protection from federal fishery management measures, harvests from state-managed fisheries and their associated protection measures, efforts to protect endangered species by other federal agencies, and other non-fishing activities.

### **3.9.1 Reasonably Foreseeable Future Actions**

The most recent analysis of RFFAs for the groundfish fisheries is in the harvest specifications EIS and most recent BSAI groundfish harvest specifications (2011). The RFFAs are described in the Harvest Specifications EIS section 3.3, are applicable for this analysis, and are adopted by reference. A summary table of these RFFA is provided below. The table summarizes the RFFAs identified applicable to this analysis that are likely to have an impact on a resource component within the action area and timeframe. Actions are understood to be human actions (e.g., a proposed rule to designate northern right whale critical habitat in the Pacific Ocean), as distinguished from natural events (e.g., an ecological regime shift). CEQ regulations require a consideration of actions, whether taken by a government or by private persons, which are reasonably foreseeable. This is interpreted as indicating actions that are more than merely possible or speculative. Actions have been considered reasonably foreseeable if some concrete step has been taken toward implementation, such as a Council recommendation or the publication of a proposed rule. Actions simply “under consideration” have not generally been included because they may change substantially or may not be adopted, and so cannot be reasonably described, predicted, or foreseen. Identification of actions likely to impact a resource component within this action’s area and time frame will allow the public and Council to make a reasoned choice among alternatives.

**Table 27. Reasonable foreseeable future actions (RFFAs)**

Ecosystem-sensitive management	<ul style="list-style-type: none"> <li>• Increasing understanding of the interactions between ecosystem components, and on-going efforts to bring these understandings to bear in stock assessments,</li> <li>• Increasing protection of ESA-listed and other non-target species components of the ecosystem,</li> <li>• Increasing integration of ecosystems considerations into fisheries decision-making</li> </ul>
Fishery rationalization	<ul style="list-style-type: none"> <li>• Continuing rationalization of Federal fisheries off Alaska,</li> <li>• Fewer, more profitable, fishing operations,</li> <li>• Better harvest and bycatch control,</li> <li>• Rationalization of groundfish in Alaskan waters,</li> <li>• Expansion of community participation in rationalization programs</li> </ul>
Traditional management tools	<ul style="list-style-type: none"> <li>• Authorization of groundfish fisheries in future years,</li> <li>• Increasing enforcement responsibilities,</li> <li>• Technical and program changes that will improve enforcement and management</li> </ul>
Other Federal, State, and international agencies	<ul style="list-style-type: none"> <li>• Future exploration and development of offshore mineral resources</li> <li>• Reductions in United States Coast Guard fisheries enforcement activities</li> <li>• Continuing oversight of seabirds and some marine mammal species by the USFWS Expansion and construction of boat harbors</li> <li>• Expansion of State groundfish fisheries</li> <li>• Other State actions</li> <li>• Ongoing EPA monitoring of seafood processor effluent discharges</li> </ul>
Private actions	<ul style="list-style-type: none"> <li>• Commercial fishing Increasing levels of economic activity in Alaska’s waters and coastal zone</li> <li>• Expansion of aquaculture</li> </ul>

RFFA that may affect target and prohibited species are shown in the table above. Ecosystem management, rationalization and traditional management tools are likely to improve the protection and management of target and prohibited species and are not likely to result in significant effects when combined with the direct and indirect effects of Alternative 2, Alternative 3 gear prohibition options, or Options e and f. Other government actions and private actions may increase pressure on the sustainability of target and prohibited fish stocks either through extraction or changes in the habitat. An increase in extraction of target species could be offset by federal management.

Ecosystem management, rationalization and traditional management tools are likely to improve the protection and management of target and prohibited species and are not likely to result in significant effects when combined with the direct and indirect effects of Alternatives 2 or 3. Other government actions and private actions may increase pressure on the sustainability of target and prohibited fish stocks either through extraction or changes in the habitat. An increase in extraction of target species could be offset by federal management.

RFFA for habitat and the ecosystem include ecosystem-sensitive management, rationalization, traditional management tools, actions by other federal, state and international agencies, and private actions. Ecosystem-sensitive management, rationalization, and traditional management tools are likely to increase protection to ecosystems and habitat by considering ecosystems and habitat more in management decisions and by improving the management of the fisheries through the observer program, catch accounting, seabird and marine mammal protection, gear restrictions, and VMS. Overall the cumulative effects on habitat and ecosystems are beneficial and not likely to result in significant impacts in combination with the impacts from Alternatives 2 or 3.

RFFA for marine mammals and seabirds include ecosystem-sensitive management, rationalization, traditional management tools, actions by other federal, state and international agencies, and private actions. Ecosystem-sensitive management, rationalization, and traditional management tools are likely to increase protection to marine mammals and seabirds by considering these species more in management decisions and by improving the management of the fisheries through the observer program, catch accounting, seabird avoidance measures, and vessel monitoring systems (VMS). Any action by other entities that may impact marine mammals and seabirds will likely be offset by additional protective measures for the federal fisheries to ensure ESA-listed mammals and seabirds are not likely to experience jeopardy or adverse modification of critical habitat. Direct mortality by subsistence harvest is likely to continue, but these harvests are tracked and considered in the assessment of marine mammals and seabirds. The cumulative effect of these impacts in combination with Alternatives 2 or 3 is likely to be primarily beneficial and is not likely to be significant because of the limited intensity of Alternatives 2 and 3.

### **3.9.2 Global Warming**

Changes in the Bering Sea due to global warming may be of a concern to the organisms that live within this environment. The release of carbon to the atmosphere from the burning of fossil fuels likely contributes to global warming. The impacts of global warming in the Bering Sea can include a rise in sea surface temperature, retreat of sea ice and acidification of marine waters.

The following information is from the January 9, 2007 Federal Register notice regarding the proposed listing of polar bears (72 FR 1064). This is a recent, general description of the potential changes in sea ice and the marine ecosystem due to Arctic warming.

All models predict continued Arctic warming and continued decreases in the Arctic sea ice cover in the 21st century (Johannessen 2004, p. 328) due to increasing global temperatures, although the level of increase varies between models. Comiso (2005, p. 43) found that for each 1° Centigrade (C) (1.6 °F) increase in surface temperature (global average) there is a corresponding decrease in perennial sea ice cover of about 1.48 million km<sup>2</sup> (.57 million mi<sup>2</sup>). Further, due to increased warming in the Arctic region, accepted models project almost no sea ice cover during summer in the Arctic Ocean by the end of the 21st century (Johannessen et al. 2004, p. 335). More recently, the [National Snow and Ice Data Center] cautioned that the Arctic will be ice-free by 2060 if current warming trends continue (Serreze [and Rigor] 2006, p. 2). The winter maximum sea ice extent in 2005 and 2006 were both about 6 percent lower than average values, indicating significant decline in the winter sea ice cover. In both cases, the observed surface temperatures were also significantly warmer and the onset of freeze-up was later than normal. In both years, onset of melt also happened early (Comiso in press). A continued decline would mean an advance to the north of the 0 °C (32 °F) isotherm temperature gradient, and a warmer ocean in the peripheral seas of the Arctic Ocean. This in turn may result in a further decline in winter ice cover. Predicted Arctic atmospheric and oceanographic changes for time periods through the year 2080 include increased air temperatures, increased precipitation and run-off, and reduced sea ice extent and duration (ACIA 2005, tables on pp. 470 and 476).

A recent study of the Bering Sea, one of the most productive marine ecosystems on the planet, concluded “[a] change from arctic to subarctic conditions is underway in the northern Bering Sea” (Grebmeier et al. 2006, p. 1461). This is being caused by warmer air and water temperatures, and less sea ice. “These observations support a continued trend toward more subarctic ecosystem conditions in the northern Bering Sea, which may have profound impacts on Arctic marine mammal and diving seabird populations as well as commercial and subsistence fisheries” (Grebmeier et al. 2006, p. 1463).

With the increase in atmospheric carbon dioxide, additional carbon dioxide may be absorbed by marine waters resulting in acidification (The Royal Society 2005). The acidification may have an impact on those organisms that depend on calcium carbonate for skeletal structure, such as copepods, pteropods, and clams. Human inputs of carbon into the atmosphere may acidify marine waters, which may impact benthic organisms that depend on calcium carbonate for skeletal structure. This potential effect in combination with the potential effects of nonpelagic trawling on benthic habitat may result in cumulative adverse impacts for organisms depending directly and indirectly on the benthic habitat. The effects of acidification and ocean warming may be widespread while nonpelagic trawling effects would be limited to locations where trawling occurs. It is not possible to predict the level of impact the combined effect may have because the level of acidification and the organisms' responses are not clearly understood. No evidence exists that a significant cumulative impact is occurring at this time, but additional studies should be encouraged to provide a better understanding of future impacts.

Considering the direct and indirect impacts of the proposed action when added to the impacts of past and present actions previously analyzed in other documents that are incorporated by reference and the impacts of the reasonably foreseeable future actions listed above, the cumulative impacts of the proposed action are determined to be not significant.

### **3.10 Management and Enforcement Considerations**

Section 4.6 addresses the enforcement considerations of the proposed alternatives and options, and discusses the effects the action could have on management and enforcement, depending on the alternative and option selected. Briefly, if the Council wishes to identify HAPC areas around skate egg concentration sites *and* wishes to enforce protections through gear prohibitions, the Council must adopt areas of a minimum size to allow effective VMS tracking for enforcement. The Council must also consider establishing HAPC boundaries along latitude and longitude lines, wherever practical. The minimum thresholds should be established with a buffer of at least 1 nm beyond the boundary of the area to be protected in order to account for current VMS capabilities, potential GPS error, and the dislocation between vessels and deployed gear. Should the council decide to implement trawl gear restrictions for these areas, the Enforcement Committee has recommended prohibition of all trawl activity in these areas.

## 4.0 REGULATORY IMPACT REVIEW (RIR)

A Regulatory Impact Review (RIR) is required under Presidential Executive Order (EO) 12866 (58 FR 51735; October 4, 1993). The requirements for all regulatory actions specified in EO 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.”*

EO 12866 requires that the Office of Management and Budget (OMB) 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.

## 4.1 Introduction and Problem Statement

Habitat Areas of Particular Concern (HAPC) are geographic sites that fall within the distribution of essential fish habitat (EFH) for federally managed species. HAPCs are areas of special importance that may require additional protection from adverse fishing effects. EFH provides a means for the North Pacific Fishery Management Council (Council) to identify HAPCs (50 C.F.R. 600.815(a)(8)) within Fishery Management Plans (FMP). Specific to fishery actions, HAPCs are areas within EFH that are rare and are ecologically important, sensitive to disturbance, or may be stressed.

The Council has a formalized process identified within its FMPs for selecting HAPCs. Under this process, the Council periodically considers whether to set a priority habitat type (or types). If so, the Council initiates a request for proposals (RFP) for HAPC candidate areas that meet the specific priority habitat type. Members of the public, non-governmental organizations, and Federal, State, and other agencies may submit HAPC proposals. Sites proposed under this process are then sent to the Council’s plan teams for scientific review to determine ecological merit. Council and agency staff also review proposals for socioeconomic and management and enforcement impacts. This combined information is then presented to the Scientific and Statistical Committee (SSC), the Advisory Panel (AP), the Enforcement and Ecosystem Committees, if necessary, and to the Council, which may choose to select HAPC proposals for a full analysis and subsequent implementation. The Council may also modify proposed HAPC sites and management measures during its review, or request additional stakeholder input and technical review. (See Appendix A for details on the HAPC process methodology for this 2010-2012 RFP cycle.)

#### **4.1.1 Statement of Purpose and Need**

The Council adopted the following Statement of Purpose and Need at its February 2011 meeting:

*HAPCs are geographic sites that fall within the distribution of Essential Fish Habitat for the Council's managed species. The Council has a formalized process, identified in its FMPs, for selecting HAPCs that begins with the Council identifying habitat priorities—here, areas of skate egg concentration. Candidate HAPCs must be responsive to the Council priority, must be rare (defined as uncommon habitat that occurs in discrete areas within only one or two Alaska regions), and must meet one of three other considerations: provide an important ecological function; be sensitive to human-induced degradation; or be stressed by development activities.*

*The candidate HAPCs identify sites of egg concentration by skate species (Rajidae) in the eastern Bering Sea. Skates are elasmobranch fish that are long-lived, slow to mature, and produce few young. Skates deposit egg cases in soft substrates on the sea floor in small, distinct sites. A reproducing skate deposits only several egg cases during each reproductive season. Depending on the species, a single egg case can hold from one to four individual skate embryos, and development can take up to three years. Thus, a single egg case site will hold several year classes and species, and eggs growing at different rates.*

*Distinct skate egg deposition sites have been highlighted by skate stock experts while assessing skate information from research survey and catch locations. The scientists noted repeated findings of distinct sites where egg cases recruit to sampling or fishing gear contacting the sea floor: egg case prongs (or horns) entangle in or cases recruits into the gear. The eggs and embryos are highly susceptible during their lengthy development to disturbance, damage, or destruction from fishing gear that contacts the sea floor. Fishing activities within these sites can also disrupt recently hatched juveniles and reproductive adult skates depositing new eggs in these sites. It is therefore important to protect areas of skate egg concentration and limit the loss of skates during its early life stages.*

#### **4.2 Alternatives and Options**

In order to address the problem described in the above statement of Purpose and Need, the Council identified three alternatives and five options for analysis, shown below. Alternative 1, the status quo, or no action alternative, involves no measures to identify or conserve areas of skate egg concentration as HAPCs. Alternative 2 would identify areas of skate egg concentration as HAPCs. The Council may select individually, severally, or all of the six areas identified as potential skate egg concentration HAPCs. Under Alternative 2, the Council is not required to limit fishing activities or prohibit gear types that make contact with the sea floor. Alternative 3 provides for both the identification of skate egg concentration HAPCs and for the conservation of these areas through prohibitions of gear types that make contact with the sea floor. The Council may select, in combination with any skate egg concentration designated as a HAPC, to limit fishing activities that make contact with the sea floor in these areas by prohibiting the use of “mobile bottom contact,” pelagic, “bottom contact,” or all fishing gear.

Further, under any Alternative, in any combination of skate egg concentration HAPCs and with any combination of conservation and management measures, the Council may identify the research and monitoring of areas of skate egg case concentration as a research priority and incorporate it into the Council's annual research priority list for continuing research, to evaluate skates, skate egg concentration areas, and their ecology and habitat.

In order to address the issues described in its statement of purpose and need, the Council identified three alternatives and five options for analysis, shown below. In addition, an FMP housekeeping option has been added to the analysis (Option f).

**Alternative 1: Status quo; no action.**

No measures would be taken to identify, or to identify and conserve, areas of skate egg concentration as HAPCs.

**Alternative 2: Identify skate egg concentration HAPC(s).**

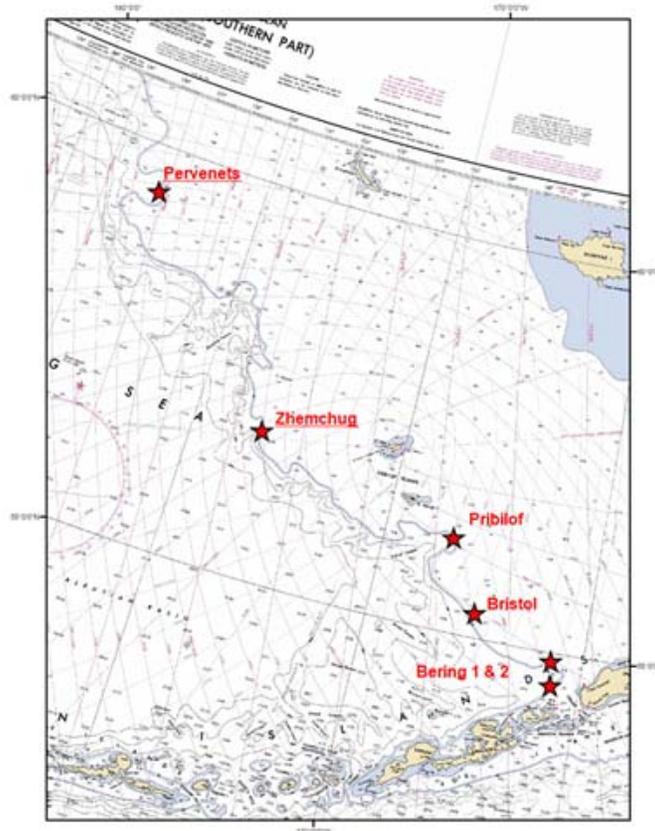
The Council may select to identify – individually, severally, or all six of – the areas of skate egg concentration as HAPCs.<sup>14</sup> The intent of Alternative 2 is to “discourage fishing in these areas” of skate egg concentration with gear that makes contact with the sea floor.

**Table 28. The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 2.**

Site name <sup>a</sup>	Predominant skate species	Depth of max. egg density (m)	Maximum egg density (eggs/km <sup>2</sup> )	Area of HAPC nm <sup>2</sup>	Boundaries of HAPC (°N latitude or °W longitude)			
					North	South	West	East
1. Bering 1	Alaska	145	800,406	18.4	54°53'	54°49'	165°46'	165°38'
2. Bering 2	Aleutian	380	62,992	17.5	54°38'	54°33'	165°45'	165°34'
3. Bristol	Bering	156	6,188	13.7	55°21'	55°17'	167°40'	167°34'
4. Pribilof	Alaska	205	16,473	1.2	56°11'	56°10'	168°28'	168°26'
5. Zhemchug	Alaska	217	610,064	3.2	56°57'	56°54'	173°23'	173°21'
6. Pervenets	Alaska, Bering, Aleutian	316	334,163	27.7	59°28'	59°22'	177°43'	177°34'
<b>Total area of the eastern Bering Sea proposed as HAPCs under Alternative 2 = 81.7 nm<sup>2</sup></b>								

<sup>a</sup> Counterintuitively, the Bering 2 site is south of the Bering 1 site. Sites 3 through 6 run south to north.

<sup>14</sup> 50 C.F.R. 600.815(a)(8). Essential Fish Habitat (EFH) provisions provide a means by which the Council may identify HAPCs within FMPs.



**Figure 12. The locations in the eastern Bering Sea of the six skate egg concentration HAPCs (not to scale).**

At each of the six areas of skate egg concentration, the spatial extent of bottom trawls containing more than 1,000 egg cases per km<sup>2</sup> was established. Boundary lines are then snapped outward to the nearest minute of latitude or longitude.

**Alternative 3: Identify and conserve skate egg concentration HAPC(s).**

The Council may select to identify – individually, severally, or all six of – the areas of skate egg concentration as HAPCs – AND – the Council may select different conservation and management options for any area identified as a skate egg concentration HAPC:

**Option a: Prohibit within skate egg concentration HAPC(s) the use of “mobile bottom contact”<sup>15</sup> fishing gear: nonpelagic (i.e., bottom) trawl, dredge, and dinglebar gear.**

**Option b: Prohibit within skate egg concentration HAPC(s) the use of “mobile bottom contact” and pelagic trawl fishing gear: nonpelagic and pelagic trawl, dredge, and dinglebar gear.<sup>16</sup>**

**Option c: Prohibit within skate egg concentration HAPC(s) the use of “bottom contact”<sup>17</sup> fishing gear: nonpelagic trawl, dredge, dinglebar, pot, and hook and line (i.e., longline) gear.**

<sup>15</sup> 50 C.F.R. 679.2.

<sup>16</sup> See 50 C.F.R. 679.2 for the particular and intricate components defining “pelagic trawl” fishing gear.

<sup>17</sup> 50 C.F.R. 679.2.

**Option d: Prohibit within skate egg HAPC(s) the use of all fishing gear: nonpelagic and pelagic trawl, dredge, dinglebar, pot, and hook and line gear.**

To achieve effective enforcement of these areas, Alternative 3 establishes a minimum size threshold for the core concentration areas to be protected of at least 5 nm to a side and are then, where appropriate, enlarged with a buffer of 1 nm beyond the original boundary under Alternative 2. Boundaries are then snapped outward to the nearest minute of latitude and longitude.

**Table 29. The six areas of skate egg concentration proposed for identification as a HAPC under Alternative 3.**

Site name <sup>a</sup>	Predominant skate species	Depth of max. egg density (m)	Maximum egg density (eggs/km <sup>2</sup> )	Area of HAPC nm <sup>2</sup>	Boundaries of HAPC (°N latitude or °W longitude)			
					North	South	West	East
1. Bering 1	Alaska	145	800,406	41.8	54°54'	54°48'	165°48'	165°36'
2. Bering 2	Aleutian	380	62,992	40.9	54°39'	53°32'	165°47'	165°37'
3. Bristol	Bering	156	6,188	34.4	55°22'	55°16'	167°42'	167°32'
4. Pribilof	Alaska	205	16,473	28	56°13'	56°08'	168°32'	168°22'
5. Zhemchug	Alaska	217	610,064	27.4	56°58'	56°53'	173°27'	173°17'
6. Pervenets	Alaska, Bering, Aleutian	316	334,163	53.3	59°29'	59°21'	177°45'	177°36'
<b>Total area in the eastern Bering Sea proposed as HAPCs under Alternative 3 = 225.8 nm<sup>2</sup></b>								

<sup>a</sup> Counterintuitively, the Bering 2 site is south of the Bering 1 site. Sites 3 through 6 run south to north.

**Additional Options**

The following options are applicable to ALL of the alternatives, in any combination of skate egg concentration HAPCs, and with any combination of conservation and management measures the Council selects:

**Option e: Suggest adding research and monitoring of areas of skate egg concentration to the Council's research priority list.**

The Council may suggest incorporating the continued research and monitoring of skate species into the Council's annual research priority list, to evaluate skate populations, skate egg concentration areas, and their ecology and habitat.

**Option f: Adopt formatting standards as stated in the final rule implementing Amendment 89 to the BSAI Groundfish FMP.**

The Council may approve the consolidation of figures and tables that describe areas in Amendment 89 to the BSAI Groundfish FMP, which establishes Bering Sea habitat conservation measures. Color Figures 66-69 in Appendix B describe the Bering Sea Habitat Conservation Area, the Northern Bering Sea Research Area and Saint Lawrence Island Habitat Conservation Area (HCA), and the Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area, respectively.

## **4.3 Background**

### **4.3.1 BSAI Groundfish Fisheries**

The domestic groundfish fishery off Alaska is the largest fishery by volume in the U.S. The annual North Pacific Groundfish Stock Assessment and Fishery Evaluation Report contains economic summaries and detailed information about the BSAI commercial groundfish fisheries. The 2012-13 BSAI groundfish annual catch limits (ACLs) are shown in the table below. The sum of the total allowable catches (TACs) for all groundfish is 2,000,000 mt. The TACs were set below the sum of the recommended ABCs for 2012 and 2013 (2.51 million t and 2.64 million t, respectively). The status of BSAI groundfish stocks continues to appear favorable. Many stocks are rebounding due to increased recruitment. The sum of the biomasses for 2012 (19.4 million t) is down approximately 6% compared to 2011 (20.6 million t). Pollock and Pacific cod biomasses are increasing after a period of decline. Flatfishes generally are trending upwards.

Table 30. Draft recommendations for OFL, ABC, and TAC (mt) for 2012-13 in the BSAI groundfish fisheries (as of December 2011).<sup>18</sup>

Species	Area	2012			2013		
		OFL	ABC	TAC	OFL	ABC	TAC
Pollock	EBS	2,474,000	1,220,000	1,200,000	2,840,000	1,360,000	1,201,900
	AI	39,600	32,500	19,000	42,900	35,200	19,000
	Bogoslof	22,000	16,500	500	22,000	16,500	500
Pacific cod	BSAI	369,000	314,000	261,000	374,000	319,000	262,900
Sablefish	BSAI	5,070	4,280	4,280	5,010	4,220	4,220
	BS	2,640	2,230	2,230	2,610	2,200	2,200
	AI	2,430	2,050	2,050	2,400	2,020	2,020
Atka mackerel	Total	96,500	81,400	50,763	78,300	67,100	42,083
	EAI/BS		38,500	38,500		31,700	31,700
	CAI		22,900	10,763		18,900	8,883
	WAI		20,000	1,500		16,500	1,500
Yellowfin sole	BSAI	222,000	203,000	202,000	226,000	207,000	203,900
Rock sole	BSAI	231,000	208,000	87,000	217,000	196,000	87,000
Greenland turbot	Total	11,700	9,660	8,660	9,700	8,030	8,030
	BS		7,230	6,230		6,010	6,010
	AI		2,430	2,430		2,020	2,020
Arrowtooth flounder	BSAI	181,000	150,000	25,000	186,000	152,000	25,000
Kamchatka flounder	BSAI	24,800	18,600	17,700	24,800	18,600	17,700
Flathead sole	BSAI	84,500	70,400	34,134	83,100	69,200	34,134
Alaska plaice	BSAI	64,600	53,400	24,000	65,000	54,000	24,000
Other flatfish	BSAI	17,100	12,700	3,200	17,100	12,700	3,200
Pacific Ocean perch	BSAI	35,000	24,700	24,700	33,700	28,300	28,300
	BS		5,710	5,710		6,540	6,540
	EAI		5,620	5,620		6,440	6,440
	CAI		4,990	4,990		5,710	5,710
	WAI		8,380	8,380		9,610	9,610
Northern rockfish	BSAI	10,500	8,610	4,700	10,400	8,490	4,700
Blackspotted/Rougheye	BSAI	576	475	475	605	499	499
	EBS/EAI		231	231		241	241
	CAI/WAI		244	244		258	258
Shortraker rockfish	BSAI	524	393	393	524	393	393
Other rockfish	BSAI	1,700	1,280	1,070	1,700	1,280	1,070
	BS		710	500		710	500
	AI		570	570		570	570
Squid	BSAI	2,620	1,970	425	2,620	1,970	425
Skate	BSAI	39,100	32,600	24,700	38,300	32,000	24,746
Shark	BSAI	1,360	1,020	200	1,360	1,020	200
Octopus	BSAI	3,450	2,590	900	3,450	2,590	900
Sculpin	BSAI	58,300	43,700	5,200	58,300	43,700	5,200
Total	BSAI	3,996,000	2,511,778	2,000,000	4,341,869	2,639,792	2,000,000

<sup>18</sup> The OFL and ABC for 2013 will likely be revised later in 2012 to lower amounts; the TAC will likely be higher.

### 4.3.2 Skate Fishery Management and Stock Status

The BSAI skate complex is managed in aggregate, with a single set of harvest specifications applied to the entire complex. Two different assessment methodologies are used for skates, however. Beginning with the 2008 assessment, harvest recommendations for Alaska skate (*Bathyraja parmifera*), the most abundant skate species in the BSAI, are made using the results of an age structured model and Tier 3. The remaining species (“other skates”) are managed under Tier 5 due to a lack of data. The Tier 3 and Tier 5 recommendations are combined to generate recommendations for the complex as a whole.

The current target fishery for skates in the BSAI began in 2011. Most skates are caught incidentally in the hook-and-line/longlining fishery for Pacific cod, and in trawl fisheries for pollock and flatfish. Between 24% and 39% of the total observed skate catch was retained during 2003 through 2006, primarily consisting of Aleutian and Alaska skate.

Until 2011, skate species were managed as part of the “Other Species” management category within the BSAI FMP. In October 2009, the NPFMC approved Amendment 95 to the BSAI FMP, which separated skates from the BSAI Other Species complex into a target category. Beginning in 2011, skates have been managed as a single complex with skate-specific ABC and OFL. Previously, skates were taken only as bycatch in fisheries directed at target species in the BSAI, so future catches of skates are more dependent on the distribution and limitations placed on target fisheries than on any harvest level established for this category.

**Table 31. Aggregate 2011 through 2013 harvest recommendations for the BSAI skate complex**

Quantity	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2011	2012	2012	2013
OFL (t)	37,817	37,169	39,077	38,326
ABC (t)	31,523	30,966	32,621	31,974

The ABC and OFL recommendations for Alaska skates and Other Skates are slightly higher in the 2011 assessment than in 2010. For Other Skates, a slight decrease in the 2011 biomass estimate reduced the 3-survey-average and the resulting harvest recommendations. There is an overall increase in skate biomass in the Aleutian Islands and eastern Bering Sea (biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year). The OFL and ABC for 2012 and 2013 are those recommended by the plan team. The data included in the 2011 year assessment are updated 2010 and preliminary 2011 catch data, the 2011 EBS shelf survey data, and updated fishery and survey length compositions. Catch data are current through November 5, 2011. In the most recent SAFE, no changes were made to the assessment methodology.

**Table 32. Status and catch specifications (t) of skates in recent years in the BSAI**

Year	Age 0+ Biomass	OFL	ABC	TAC	Catch
2010	608,000	n/a	n/a	n/a	n/a
2011	612,000	37,800	31,500	16,500	21,034
2012	645,000	39,100	32,600	n/a	n/a
2013	629,000	38,300	32,000	n/a	n/a

The year 2011 was the first year that the skate complex was managed outside the context of the former “other species” complex. The Alaska skate portions of the 2011 ABC and OFL were specified under Tier 3, while the “other skates” portions were specified under Tier 5. For the skate complex as a whole, ABCs for 2012 and 2013 total 32,600 t and 32,000 t, respectively, and OFLs for 2012 and 2013 total 39,100 t and 38,300 t, respectively.

### 4.3.3 Incidental catch and discards

Most skates before 2011 have been caught incidentally in the longline fishery for Pacific cod and in the bottom trawl fisheries for pollock and flatfish. Retention rates ranged from 30 to 40% of the total observed skate catch during 2003 through 2009, primarily consisting of Aleutian and Alaska skate; it is likely that only the larger skates are retained. Incidental catch of skates in the BSAI was 5% of the 2008 survey biomass estimate for skates.

In the BSAI, there is no directed fishery for skates at present. A directed skate fishery developed in the Gulf of Alaska in 2003 (Gaichas et al. 2003). There has been interest in developing markets for skates in Alaska, and the resource was economically valuable to the GOA participants in 2003, although the price apparently dropped in 2004. Continued interest in skates as a potential future target fishery in the BSAI as well as in the GOA should be expected.

In the EBA pollock fishery, skate bycatch nearly doubled in 2008 compared to 2007, but declined to just over one thousand t in 2010. The bycatch estimates of Alaska skate as a target species in 2010 was 1,228 t, and 881 in 2011. In the Aleutian Islands Atka mackerel fishery, the bycatch of skates, considered a sensitive or vulnerable species based on life history is variable and has averaged 158 t in the last 3 years (2007-2009). Over this same time period, the Atka mackerel fishery has taken an average of 13% of the total Aleutian Islands skate bycatch. It is unknown if the absolute levels of skate bycatch in the Atka mackerel fishery are of concern.

At present the Catch Accounting System (CAS) reports species specific catch for big (*Raja binoculata*) and longnose (*Raja rhina*) skates. All remaining skate species are reported as “other”. Big and longnose skates make up only a small fraction of BSAI skate biomass, which is dominated by the Alaska skate. The fraction of Alaska skate catch in the total “other skates” is estimated by applying the average species composition encountered during trawl surveys. In the Alaska skate model, a catch rate of 100% mortality is assumed by the assessment team. In reality, skate mortality is dependent upon the time spent out of water, the type of gear, and handling practices after capture. From fishery observer data, approximately 30% of skates are retained; however there currently is no information regarding the survival of skates that are discarded at sea.

Skates are caught in almost all fisheries and areas of the Bering Sea shelf, but most of the skate incidental catch is in the hook and line (a.k.a, longline) fishery for Pacific cod. Trawl fisheries for pollock, rock sole, flathead sole, and yellowfin sole also catch significant amounts. The catch of skates in pollock fisheries has increased in recent years, possibly because the fisheries are targeting pollock closer to the bottom.. Due to incomplete observer coverage, it is difficult to determine how many skates are actually retained. However, between 24% and 39% of the total observed skate catch was retained during the years 2003 to 2006. More skates were retained in the EBS than the AI, and it appears that species that grow to a larger maximum size (>100 cm TL) are more likely to be retained than smaller-bodied species. For example, while the Aleutian skate, a large-bodied species, made up a relatively small portion of the observed skate catch in 2005 (approximately 2%), 31% of the Aleutian skates caught were retained. However, Bering skates (a small-bodied species less than 100 cm TL) were retained less frequently (10% in 2005). Larger percentages of Alaska skates and *Raja* species are also retained; all are relatively large-bodied skates.

Historically, skates were almost always recorded as “skate unidentified,” with very few exceptions between 1990 and 2002. However, due to improvements in species identification by fishery observers initiated by Dr. Duane Stevenson (AFSC) within the Observer program in 2003, it is possible to estimate the species composition of observed skate catches in the years 2004 through 2006. Recent observer data indicate that only about one half of skate catch is not identified to the species level. This is largely because most skates are caught in longline fisheries, and if the animal drops off the longline as un-

retained incidental catch, it cannot be identified to species by the observer (approximately 80 percent of longline-caught skates are unidentified, and longline catch accounts for the majority of observed skate catch). Changes made to the observer manual at the author's request have resulted in a large increase in skate length measurements beginning in 2008.

In 2005, observers were encouraged to identify skates to genus that were dropped off of longlines, which can be done without retaining the skate; hence in 2005 more than half of the unidentified skates were at least assigned to the genus *Bathyraja*. Of the identified skates, the majority (90 percent) were Alaska skates, as would be expected by their dominance in terms of overall skate biomass in the BSAI. The next most commonly identified species BSAI-wide was Aleutian skate, at 6.6% of identified catch, followed by Bering skates at 4.3 %, big skates at 3.6%, and whiteblotched at approximately 1.3% across the BSAI. It should be noted that the observed skate catch composition may not reflect the true catch composition, possibly due to selective retention of larger species or to a higher likelihood of identifying distinctive species. However, when viewed by area (EBS vs. AI), it is clear that the majority of identified Aleutian and whiteblotched skates are caught in AI fisheries, and that the species composition of the observed catch in the AI is very different from the EBS.

#### **4.4 Effects on Harvesters, Processors, and Communities**

Fisheries impact communities through the economic and socioeconomic activities generated by participants in the various harvesting sectors, processing sectors, and supporting industries.

##### **4.4.1 Catch by Trawl Gear in HAPC Sites**

Trawl data were obtained from the VMS-enabled Catch-in-Areas database, by Steve Lewis of the AKRO. The query selected trawl effort (2003 through 2011) inside any of the six areas of skate egg concentration identified by the NPFMC for HAPC consideration. These data represent observed hauls only (VMS track lines). The targeting algorithm used in the database differentiates between mid-water pollock as more than 90 percent pollock, and bottom pollock as predominately, but less than 90percent, pollock. Two sites, Zhemchug and Pribilof, showed no trawl effort. Note that all catch from any tow passing through a proposed HAC accrued towards the total.

###### **4.4.1.1 Non-pelagic (bottom) trawls**

Non-pelagic (i.e., bottom) trawl effort in areas of skate egg concentration, as defined under Alternative 3, between 2003 and 2011 was focused on Bering 1, Bering 2, and the Pervenets sites, with no effort in Bristol, Pribilof, or Zhemchug, as shown in the tables below. Approximately one half of the total catch in areas of skate egg concentration was in Bering 2 and focused on arrowtooth flounder. Pacific cod and flathead sole were the other two species with substantial catches, although six other species were identified as targets in the three fished sites.

A total amount of **10,495** metric tons of groundfish were taken in hauls intersecting the Bering 1, Bering 2, Pribilof, and the Pervenets proposed HAPC sites, under Alternative 3, during the years 2003 through 2011. The value of potentially foregone catch was estimated using annual catch by species from the tables below and annual gross ex-vessels prices from the 2011 Economic SAFE Report. For Greenland turbot, first gross wholesale value was used, rather than gross ex-vessel price, because turbot were only taken by catcher processors.

If all **10,495 mt** of groundfish catch had been retained and processed, it is estimated that the gross ex-vessel value of this catch would have been **\$4,477,153** (total over the nine year period), as shown by the tables below. Thus, on average, a closure to bottom trawling of these sites would result in a maximum

foregone catch of an average of **1,166 mt** per year, valued at **\$497,461** per year, which is the total gross ex-vessel price divided by the nine years (2003 through 2011) of catch data collected. This average of \$497,461 per year of estimated forgone bottom catch equates to approximately **0.09%** of an average (2006 to 2010) annual gross value of the BSAI trawl groundfish (\$515,840,000).

**Table 33. Nonpelagic (i.e., bottom trawl) trawl catch (mt) per year, under Alternative 3. Sites not listed experienced no catch in the years examined.**  
**Source: NMFS HCD and NPFMC.**

HAPC Area and Year	Species catch, in metric tons (mt)											
	Atka Mackerel	Pollock – Bottom	Pacific Cod	Other Flatfish	Rockfish	Flathead Sole	Other Species	Rock Sole	Turbot	Arrowtooth	Yellowfin	Total
<b>1. Bering 1</b>	<b>12</b>	<b>32</b>	<b>677</b>	<b>44</b>	<b>0</b>	<b>2</b>	<b>347</b>	<b>3</b>	<b>0</b>	<b>285</b>	<b>0</b>	<b>1,402</b>
2003	7	0	171	0	0	0	347	0	0	108	0	633
2004	0	0	476	44	0	0	0	3	0	0	0	522
2005	6	0	30	0	0	0	0	0	0	136	0	172
2006	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	2	0	0	0	38	0	41
2009	0	13	0	0	0	0	0	0	0	0	0	13
2010	0	20	0	0	0	0	0	0	0	3	0	22
2011	0	0	0	0	0	0	0	0	0	0	0	0
<b>2. Bering 2</b>	<b>110</b>	<b>35</b>	<b>489</b>	<b>716</b>		<b>298</b>		<b>83</b>	<b>182</b>	<b>5,671</b>	<b>12</b>	<b>7,595</b>
2003	15	0	332	95	0	5	0	0	121	188	0	756
2004	0	0	128	365	0	170	0	83	39	620	0	1,406
2005	95	0	4	243	0	123	0	0	22	580	12	1,078
2006	0	0	25	0	0	0	0	0	0	397	0	422
2007	0	0	0	7	0	0	0	0	0	171	0	178
2008	0	17	0	4	0	0	0	0	0	1,382	0	1,403
2009	0	9	0	0	0	0	0	0	0	1,687	0	1,696
2010	0	9	0	1	0	0	0	0	0	391	0	401
2011	0	0	0	0	0	0	0	0	0	255	0	255
<b>4. Pribilof</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>25</b>	<b>0</b>	<b>25</b>
2003	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	5	0	5
2007	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	14	0	14
2010	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	6	0	6
<b>6. Pervenets</b>	<b>0</b>	<b>9</b>	<b>205</b>	<b>0</b>	<b>43</b>	<b>337</b>	<b>0</b>	<b>0</b>	<b>48</b>	<b>827</b>	<b>3</b>	<b>1,473</b>
2003	0	0	0	0	0	8	0	0	48	0	0	55
2004	0	0	187	0	0	209	0	0	0	0	3	399
2005	0	0	0	0	0	0	0	0	0	118	0	118
2006	0	0	18	0	0	0	0	0	0	19	0	37
2007	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	112	0	0	0	573	0	684
2009	0	0	0	0	0	9	0	0	0	117	0	126
2010	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	9	0	0	43	0	0	0	0	0	0	53
<b>Total (mt)</b>	<b>122</b>	<b>77</b>	<b>1,371</b>	<b>759</b>	<b>43</b>	<b>637</b>	<b>347</b>	<b>86</b>	<b>230</b>	<b>6,808</b>	<b>15</b>	<b>10,495</b>

**Table 34. Gross ex-vessel value of nonpelagic (i.e., bottom trawl) trawl catch per year, under Alternative 3. Sites not listed experienced no catch in the years examined.**

HAPC Area and Year	Species catch, in metric tons (mt)											Total	Average value/year
	Atka Mackerel	Pollock - Bottom	Pacific Cod	Other Flatfish	Rockfish	Flathead Sole	Other Species	Rock Sole	Turbot	Arrowtooth	Yellowfin		
<b>1. Bering 1</b>	<b>3,045</b>	<b>10,987</b>	<b>345,387</b>	<b>15,883</b>	<b>0</b>	<b>940</b>	<b>109,776</b>	<b>1,086</b>	<b>0</b>	<b>109,071</b>	<b>0</b>	<b>596,175</b>	<b>66,242</b>
2003	1,545	0	100,933	0	0	0	109,776	0	0	34,257	0	246,510	
2004	0	0	229,216	15,883	0	0	0	1,086	0	0	0	246,186	
2005	1,500	0	15,237	0	0	0	0	0	0	59,206	0	75,944	
2006	0	0	0	0	0	0	0	0	0	0	0	0	
2007	0	0	0	0	0	0	0	0	0	0	0	0	
2008	0	0	0	0	0	940	0	0	0	14,730	0	15,671	
2009	0	5,206	0	0	0	0	0	0	0	0	0	5,206	
2010	0	5,781	0	0	0	0	0	0	0	877	0	6,658	
2011	0	0	0	0	0	0	0	0	0	0	0	0	
<b>2. Bering 2</b>	<b>28,332</b>	<b>14,367</b>	<b>278,193</b>	<b>273,456</b>	<b>0</b>	<b>116,696</b>	<b>0</b>	<b>30,055</b>	<b>401,045</b>	<b>2,070,286</b>	<b>5,137</b>	<b>3,217,566</b>	<b>357,507</b>
2003	3,514	0	195,633	30,114	0	1,581	0	0	266,046	59,574	0	556,462	
2004	0	0	61,903	132,421	0	61,751	0	30,055	86,792	225,209	0	598,131	
2005	24,817	0	2,048	105,978	0	53,365	0	0	48,206	252,451	5,137	492,002	
2006	0	0	18,608	0	0	0	0	0	0	174,639	0	193,247	
2007	0	0	0	2,913	0	0	0	0	0	70,729	0	73,642	
2008	0	7,914	0	1,618	0	0	0	0	0	532,119	0	541,650	
2009	0	3,829	0	0	0	0	0	0	0	538,044	0	541,873	
2010	0	2,624	0	411	0	0	0	0	0	131,534	0	134,570	
2011	0	0	0	0	0	0	0	0	0	85,988	0	85,988	
<b>4. Pribilof</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8,705</b>	<b>0</b>	<b>8,705</b>	<b>967</b>
2003	0	0	0	0	0	0	0	0	0	0	0	0	
2004	0	0	0	0	0	0	0	0	0	0	0	0	
2005	0	0	0	0	0	0	0	0	0	0	0	0	
2006	0	0	0	0	0	0	0	0	0	2,244	0	2,244	
2007	0	0	0	0	0	0	0	0	0	0	0	0	
2008	0	0	0	0	0	0	0	0	0	0	0	0	
2009	0	0	0	0	0	0	0	0	0	4,510	0	4,510	
2010	0	0	0	0	0	0	0	0	0	0	0	0	
2011	0	0	0	0	0	0	0	0	0	1,951	0	1,951	
<b>6. Pervenets</b>	<b>0</b>	<b>2,744</b>	<b>103,550</b>	<b>0</b>	<b>0</b>	<b>124,069</b>	<b>0</b>	<b>0</b>	<b>105,437</b>	<b>317,735</b>	<b>1,174</b>	<b>654,708</b>	<b>72,745</b>
2003	0	0	0	0	0	2,397	0	0	105,437	0	0	107,834	
2004	0	0	89,906	0	0	75,894	0	0	0	0	1,174	166,974	
2005	0	0	0	0	0	0	0	0	0	51,581	0	51,581	
2006	0	0	13,643	0	0	0	0	0	0	8,375	0	22,019	
2007	0	0	0	0	0	0	0	0	0	0	0	0	
2008	0	0	0	0	0	43,029	0	0	0	220,457	0	263,486	
2009	0	0	0	0	0	2,749	0	0	0	37,321	0	40,071	
2010	0	0	0	0	0	0	0	0	0	0	0	0	
2011	0	2,744	0	0	0	0	0	0	0	0	0	2,744	
<b>Grand Total</b>	<b>31,376</b>	<b>28,098</b>	<b>727,129</b>	<b>289,339</b>	<b>0</b>	<b>241,705</b>	<b>109,776</b>	<b>31,141</b>	<b>506,482</b>	<b>2,505,795</b>	<b>6,311</b>	<b>4,477,153</b>	<b>497,461</b>

#### 4.4.1.2 Pelagic trawl

Pelagic trawl effort in areas of skate egg concentration from 2003 to 2011 was focused on the Bering 1 and 2, Bristol, and Pervenets sites, as shown in the table below. In these sites, effort has shifted between areas, with some being relatively more important between years. The target of the pelagic trawl fishery was pollock in all cases. Approximately one half of all pollock catch from areas of skate egg concentration took place in the Pervenets site between 2007 and 2010, showing a northward shift in the fishery. Bering 2 was fished most consistently, and Bristol showed higher catches in 2003 and 2004 but has not been active since 2007.

A total amount of **36,290** metric tons of groundfish (virtually all pollock, with de minimis amounts of other groundfish) were taken in pelagic trawl hauls intersecting four of the six proposed HAPC sites under Alternative 3 during the years 2003 through 2011. If all catches were retained and processed, it is estimated that the gross ex-vessel value of this catch over nine years and from all proposed HAPC sites would be **\$9,918,985**. Thus, on average, a closure to pelagic trawling of these sites would result in maximum foregone gross revenues of **4,032** metric tons, valued at **\$1,102,109** per year, which is the total gross ex-vessel price divided by the nine years (2003 to 2011) of catch data collected. The average of \$1,102,109 per year of estimated foregone pelagic catch equates to approximately **0.21%** of an average (2006-2010) annual gross value of the BSAI trawl groundfish (\$515,840,000).

In previous years (1990 to 2005), the Bering 2 site appears to have been important to the pollock fishery, as compared to more recent data (2003 to 2011). From the longer set of data, it is estimated that the Bering 2 site experienced an average of 5,470 to 13,037 mt of catch per year, which is the total observed pelagic trawl catch, 87,517 to 208,599 mt, divided by sixteen (1990 to 2005) (see Appendix C – Color Figure 35). It would be expected that the fleet could make up this foregone catch in other areas, adjacent or elsewhere. However, moving the fleet elsewhere to make up foregone catch may require vessels to fish outside of their preferred zone and could cause some increased operation costs (e.g., lower CPUEs, higher PSC rates, longer trip times, etc.).

It would be expected that the fleet could make up this foregone catch in other areas, adjacent or elsewhere. However, moving the fleet elsewhere to make up foregone catch may require vessels to fish outside of their preferred zone and could cause some increased operation costs (e.g., lower CPUEs, higher PSC rates, longer trip times, etc.)

**Table 35. Pelagic trawl catch, in tons of groundfish (pollock) per year.**  
**Source: NMFS HCD.**

<b>HAPC Area and Year</b>	<b>Pollock – Bottom (mt)</b>	<b>Pollock – Midwater (mt)</b>	<b>Grand Total (mt)</b>	<b>Max. Est. Gross Ex-vessel Value<sup>a</sup></b>
<b>1. Bering 1</b>	<b>0</b>	<b>6,575</b>	<b>6,575</b>	<b>1,678,264</b>
2003	0	381	381	89,687
2004	0	4,328	4,328	1,009,290
2005	0	39	39	10,725
2006	0	46	46	12,954
2007	0	246	246	69,815
2008	0	0	0	0
2009	0	275	275	114,345
2010	0	0	0	0
2011	0	1,260	1,260	371,448
<b>2. Bering 2</b>	<b>427</b>	<b>7,558</b>	<b>7,986</b>	<b>1,487,372</b>
2003	23	211	234	55,084
2004	322	1,369	1,691	394,341
2005	0	0	0	0
2006	42	1,262	1,303	366,925
2007	41	4,616	4,657	624,360
2008	0	101	101	46,662
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
<b>3. Bristol</b>	<b>0</b>	<b>5,828</b>	<b>5,828</b>	<b>1,380,484</b>
2003	0	3,543	3,543	834,022
2004	0	2,016	2,016	470,131
2005	0	0	0	0
2006	0	5	5	1,408
2007	0	264	264	74,923
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
<b>4. Pribilof</b>	<b>0</b>	<b>658</b>	<b>658</b>	<b>184,115</b>
2003	0	0	0	0
2004	0	0	0	0
2005	0	216	216	59,400
2006	0	329	329	92,646
2007	0	113	113	32,069
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
<b>5. Zhemchug</b>	<b>0</b>	<b>1,100</b>	<b>1,100</b>	<b>269,088</b>
2003	0	0	0	0
2004	0	856	856	199,619
2005	0	213	213	58,575
2006	0	19	19	5,350
2007	0	0	0	0
2008	0	12	12	55,44
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
<b>6. Pervenets</b>	<b>0</b>	<b>14,570</b>	<b>14,570</b>	<b>4,919,662</b>
2003	0	0	0	0
2004	0	0	0	0
2005	0	0	0	0
2006	0	0	0	0
2007	0	6,178	6,178	1,753,316
2008	0	3,556	3,556	1,642,872
2009	0	806	806	335,135
2010	0	4,031	4,031	1,188,339
2011	0	0	0	0
<b>Total</b>	<b>4270</b>	<b>36,290</b>	<b>36,290</b>	<b>9,918,985</b>

#### **4.4.2 Additional Costs**

Though it would be expected that the fleet could make up the foregone trawl catch in other areas, adjacent or elsewhere, there may be socioeconomic impacts of Alternative 3 beyond what is provided by the quantitative analysis. Moving the fleet elsewhere to make up foregone catch could be problematic if vessels are required to fish outside of their preferred zone. Following is a description of public testimony on the implementation of gear prohibitions in the proposed HAPC sites.

Public testimony during the February 2012 Council meeting focused heavily on the Bering 1 and Bering 2 sites. Specifically, the Bering 1 site was important to industry during the years 1986 to 1999, which is sooner than the data the analysis considered (2003 to 2011) and years without VMS effort data. The Bering 2 site continues to be of high importance to those vessels fishing for pollock (though pollock has recently moved north, greatly reducing activity in Bering 1 and 2), and the inshore fleet could feel significant impacts during the B season from any trawl restrictions. The Bering 2 site encompasses a narrow fishing lane used by the pollock CV fleet during the summer months, particularly in July and August. The Bering 2 site is also in an area where the bathymetry slopes rapidly from relatively shallow depths, at the southeast edge, to much deeper waters along the northwest edge. Thus, in years when pollock (or cod) are aggregated at the deeper end of the Bering 2 site, vessels line up and tow very closely to one another, in order to catch pollock (or cod) along a particular depth contour in the area known as “the horseshoe.” Consequently, a prohibition to trawl gear within the Bering site would be in the middle of this fishing lane and could act as a roadblock to traffic, pinching the flow of vessels into a narrower corridor. This obstacle could hinder pollock and cod fishing, increase trip time, cause gear conflicts, and in practice render the adjacent areas unfishable.

The impacts on the maximum potential gross forgone harvest could be higher than what is predicted by the expanded catch data (i.e., from 1998 to 2010 versus 2003 to 2011). In addition, the potential displacement of the fleet could be greater than originally anticipated and thus could result in higher bycatch rates for PSC species (e.g., halibut, salmon). If the pollock trawl fleet is unable to fully prosecute the fishery during the summer months in the “horseshoe,” it may try to make up the difference later into the B season, which could raise bycatch rates, particularly for chum salmon. Also, the Bering 2 is a relatively deep water trawl and chum salmon bycatch is lower in deep water – if the fleet is pushed into shallower waters, chum bycatch could increase.

Industry testifies that if the HAPCs are only identified without any trawl restrictions, the fleet would be able to avoid the areas of skate egg concentration in a typical tow and are already avoiding them in the east/west tow from 73 to 76 fathoms.

#### **4.4.1 Catch by Longline (Hook and Line)**

Longline effort for groundfish across the six HAPC sites was low during the thirteen years examined, as shown in Appendix B – Color Figure 36. Over the years 1998 through 2010, there were no sets in the Bering 2 site, 11 to 50 sets in the Pervenets and Bristol sites, 51 to 100 sets in the Zhemchug and Pribilof sites, and 101 to 500 sets in the Bering 1 site. In the shallower HAPC sites that are less than 200m – Bering 1, Bristol, Zhemchug – the likely target was Pacific cod. In the deeper-water HAPC sites – Bering 2, Pribilof, and Pervenets – Pacific cod was also likely the target, although sablefish, Greenland turbot, and rockfish may also have been taken.

Observed longline skate egg bycatch catch per unit effort (CPUE) was also relatively low during the fourteen years examined, except in the Bering 1 site, as shown in Appendix B – Color Figure 37. Over the years 1998 through 2011, there was no observed skate egg bycatch in the longlining fleet in the Pervenets,

Zhemchug, Bristol, and Bering 2 site, and 3 to 500 observed skate eggs taken as bycatch in the Pribilof site. In the Pervenets site, however, over 1,000 skate eggs were observed as bycatch. The analysis generating the CPUE bycatch data (i.e., Appendix B – Color Figure 37) was based on tows with observed skate egg bycatch only.

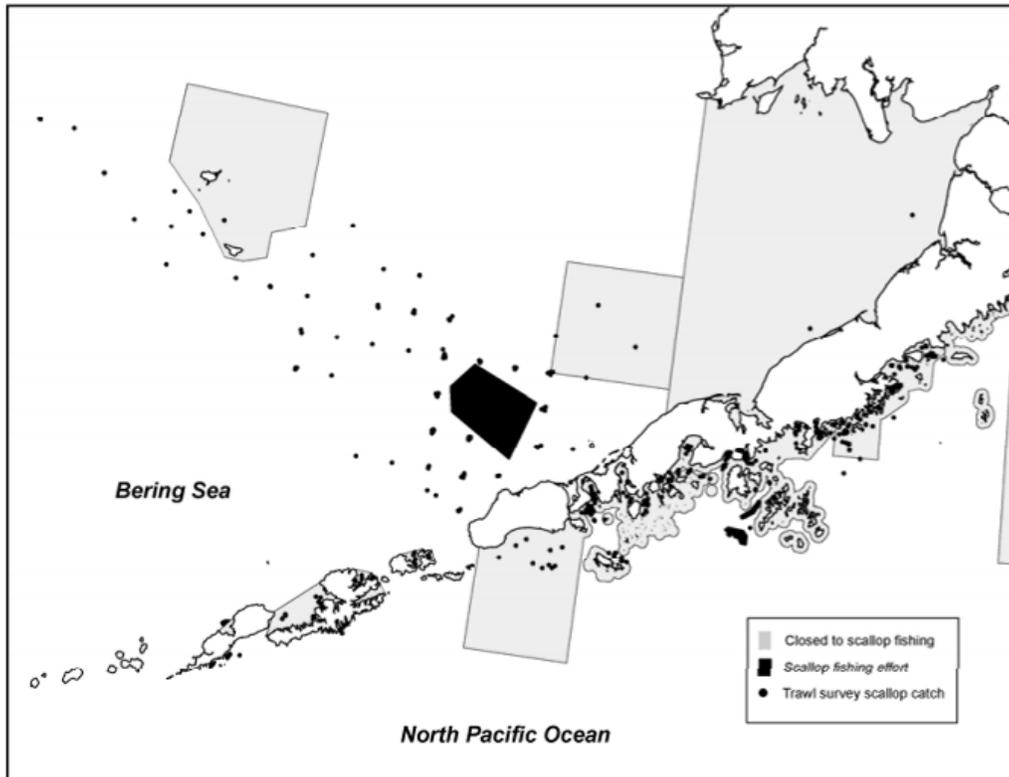
Members of the longline (or hook and line) industry report that the fleet's interaction with skate eggs appears to industry managers to be random and inconsistent, the casings brought up on the hooks empty, and those attached to the groundline are cleared and appear to be biologically viable, though there is no scientific or observer support for these assertions. Further, the industry would like to see that longline and trawl gears are distinguished between with regard to the impact the gears have on the benthic habitat.

#### **4.4.2 Catch by Pot Gear**

Pot effort for groundfish (i.e., Pacific cod) in the proposed HAPCs sites was very low during the thirteen years examined, as shown in Appendix B – Color Figure 38. Over the years 1998 to 2010, there were no sets in the Pervenets, Zhemchug, Pribilof, Bristol, and Bering 1 sites, and only a very small indication of lifts in the Bering 2 site (approximately 3-10 overall in the southern portion of Bering 2).

#### **4.4.3 Catch by Dredge and Dinglebar Gear**

Dredge and dinglebar effort for groundfish in the six proposed HAPC sites did not occur LQ:WHAT ABOUT DREDGE FOR GROUND FISH? based on examination of locations where fisheries for scallops have occurred in the eastern Bering Sea (see the figure below, which shows scallop fishing areas), which do not overlap with the locations of the six proposed HAPCs. LQ: What about dredge for groundfish? Commercial concentrations of weathervane scallops occur along the Alaska coast in elongated beds oriented in the same direction as prevailing currents, at depths from approximately 100 to 120m, which is shallower than any of the proposed sites. Dinglebar gear is not used in the eastern Bering Sea, and therefore no fishery would be limited by prohibitions on its use in the six proposed HAPC areas.



**Figure 13. Map showing scallop fishing areas, areas closed to scallop fishing by regulation, and locations where weathervane scallops were captured during NMFS and ADF&G trawl.**

#### **4.4.4 Effects on Processors and Communities**

The effects of the alternatives and options on processors and communities would be expected to be insignificant, due to the relatively low catches from these proposed HAPC areas, and the likelihood that the catch can readily be made up elsewhere.

#### **4.5 Effects on Management, Monitoring, and Enforcement**

There are several options offered to conserve these areas of skate egg concentration from the adverse effects of fishing. Initially, the AFSC offered a range of conservation area sizes based upon the egg case concentrations of each particular site, buffered to the nearest minute of latitude and longitude, which is size dependent on the concentration or density of skate egg cases. (See Appendix B – Color Figures 3-8.) The AFSC also recommend in its original HAPC proposal that all fishing gear be prohibited from making contact with the sea floor within areas of skate egg concentration.

At the February 2012 Council meeting, the Enforcement Committee received an overview of the three alternatives presented in the analysis. During discussion, the Committee noted that if the Council wished to identify these skate egg concentration areas - AND - to protect them using VMS, then there would be a minimum size requirement that would allow for protection given the limitations of VMS polling (once or twice per hour), uncertainty in GPS locations, and the spatial dislocation between the vessel and gear. The Committee was informed that there was concern at the SSC about increasing a buffer beyond the distribution of the egg concentration site. However, while the Committee recognized the desire to use biological data (egg concentrations) to identify the sites, there would be a practical enforcement need to create a larger buffer to limit vessel activity in order to ensure conservation of the biological resource.

The Committee stated that an area 5 nm per side would be the ideal minimum because the limits of VMS to accurately track a vessel through the area. With areas smaller than 5 nm per side, although providing some level of protection to the site, the likelihood of successful enforcement goes down substantially. It was further noted that although it is technically feasible to increase VMS polling frequency, that would require additional costs to fishermen, and deviation from what are currently accepted standards (once or twice per hour). Additionally, there would be additional complications in implementing changes in how VMS operates in Alaska, and the Committee would be hesitant to recommend tweaking VMS before current concerns can be addressed. The Committee's final recommendation to the Council was to design areas to accommodate current VMS limitations rather than attempting to change VMS to accommodate smaller areas. The Committee also discussed the desire to align sides of areas with latitude and longitude, to the greatest extent practical. It is more practical for enforcement personnel and USCG pilots to quickly determine whether a vessel is inside or outside of a protected area with margins along latitude and longitude lines than an irregularly shaped area.

#### **4.5.1 Enforcement Concerns**

In February 2011, the Enforcement Committee took up a preliminary review on the proposed skate HAPCs. The Enforcement Committee also received a white paper from the USCG and NOAA that provided a background relating to the definitions enforcement personnel must work within, as well as the challenges to at-sea enforcement. The Enforcement Committee noted that the proposed Council actions included options for restricting bottom trawling, while allowing pelagic trawling in the proposed HAPC sites.

##### **4.5.1.1 Relevant Regulatory Definitions:**

For reference, the following This phrasing indicates that pelagic trawling is defined by trawling during which the foot rope is not in contact with the bottom for more than ten percent of the time. 50 C.F.R. 679.2 provides the following definitions:

(11) Mobile bottom contact gear means nonpelagic trawl, dredge, or dinglebar gear.

(12) Nonpelagic trawl means a trawl other than a pelagic trawl.

(14) Pelagic trawl gear means a trawl that:

(i) Has no discs, bobbins, or rollers;

(ii) Has no chafe protection gear attached to the footrope or fishing line;

(18) Trawl gear means a cone or funnel-shaped net that is towed through the water by one or more vessels. For purposes of this part, this definition includes, but is not limited to, beam trawls (trawl with a fixed net opening utilizing a wood or metal beam), trawls (trawl with a net opening controlled by devices commonly called doors), and pair trawls (trawl dragged between two vessels) and is further described as pelagic or nonpelagic trawl.

679.24(b)(3) *Trawl footrope*. No person trawling in any GOA area limited to pelagic trawling under §679.22 may allow the footrope of that trawl to be in contact with the seabed for more than 10 % of the period of any tow.

#### **4.5.2 Aircraft Surveillance**

Aerial surveillance is the most effective means to monitor closed or restricted gear areas. Due to the size of the Alaska region and the number of enforcement assets available, one of the most effective means of surveillance is by aircraft. While an aircraft can identify the type of vessel (e.g. longliner, trawler, seiner, pot boat, etc.), there is no way for aircraft to readily identify whether a trawl vessel is using pelagic or nonpelagic trawl gear.

Because of these definitions, the only time an aircraft would be able to determine whether a vessel was using pelagic or nonpelagic trawl gear would be if they witnessed a haulback and noted chafing gear on the foot rope or roller gear. By definition, this would make the vessel a nonpelagic trawler. All other definitions used to identify whether a vessel is conducting pelagic or nonpelagic trawl activities must be conducted by a boarding team on the vessel. At-sea enforcement of areas where pelagic trawl gear is permitted and nonpelagic trawl gear is prohibited is problematic. Aerial surveillance remains the most effective means to monitor closed or restricted gear areas. While aircraft can readily identify the type of vessel by gear, identification of pelagic or nonpelagic trawl gear by aircraft is virtually impossible.

One possible mitigating factor, at least for aerial surveillance, would be to have vessels declare what they are targeting and what gear they are using through their vessel monitoring systems (VMS) units. This is a system that is used extensively in other regions of the country, and allows enforcement personnel to quickly identify locations of various fleets by gear type and targeted species.

Observers are another possible mitigating factor because they could be in a position to identify pelagic versus nonpelagic trawls. The Enforcement Committee has noted that the Bering Sea trawl fleet is one of the most highly observed fishing fleets in the world, and the observer position reports, reviewed by enforcement personnel, could provide another potential information source.

#### **4.5.3 At-sea Enforcement**

Outside the pollock fishery, which has specific crab PSC limits to define bottom contact, it is almost impossible to define how much time a trawl net is in contact with the sea floor. There are no performance indicator definitions for other target species where vessels use pelagic or nonpelagic trawl gear. Identification of pelagic or nonpelagic trawl gear can easily be done during an at sea boarding, based upon the definition of rollers and chafing gear, but becomes more problematic in cases where gear that appears to be pelagic in nature is in contact with the sea floor more than the allowable ten percent of the time. It is nearly impossible for a boarding team to determine how much time pelagic trawl gear is in contact with the bottom, and this regulation is almost unenforceable.

Current practice, when in large fleets of vessels, is often to send boarding teams to more than one vessel. Due to the duration of the boarding, cutters would likely be restricted in the number of boardings they can conduct simultaneously due to the risk to boarding team members and concerns for the recovery of personnel at the completion of the boarding. If cutters had teams on multiple vessels, they would likely have to restrict the movement of fishing vessels until the boarding was complete to ensure appropriate response distances for the safety of boarding teams.

#### **4.5.4 Trawl Gear Restrictions**

At-sea enforcement of areas where pelagic trawl gear is permitted and nonpelagic trawl gear is prohibited is problematic. Aerial surveillance and VMS remain the most effective means to monitor closed or restricted gear areas. While aircraft can readily identify the type of vessel by gear, identification of pelagic and nonpelagic trawl gear by aircraft is virtually impossible. There have been reports of pelagic

trawl vessels spending more time in contact with the bottom, and the Coast Guard remains concerned about their ability to identify the difference between pelagic and non-pelagic trawl gear from the air. In addition, bottom tending mobile gear, particularly trawl gear, provides the greatest concern for disturbance to these sites. It would be difficult to monitor compliance with very small discreet closed areas because this would require excessive use of the major enforcement assets that are used to patrol the Bering Sea. Therefore, a minimum threshold size is proposed of at least 5nm to a side.

#### **4.5.5 Vessel Monitoring Systems (VMS)**

Another tool that can be used in tandem with a real time data reporting system is to require a vessel monitoring system (VMS). VMS is an essential requirement to show the vessel was at-sea, how long it was out, where it docked when it came into port, and the present vessel location. VMS is capable of understanding and recording small details of the ship's evolutions. It can document, for instance, specific course changes and engine speed changes by a vessel. Collectively this pattern is termed a signature. At present, there are not enough data to make a signature admissible in court as an indicator of fishing. Regardless, VMS technicians are trained to look at positioning data and other factors indicating potential fishing activity. An investigator can be dispatched to the landing site intercepting the vessel as it comes into port or even anchors in a remote area. If the captain and crew are believed to have illegally harvested a limited access program (LAP) species, the agent or officer can intercept the vessel. If, during the course of an initial investigation, a violation surfaces, the agent or officer will bring the vessel to port, seize the catch, and cite the errant fisherman.

#### **4.5.6 Enforceable Threshold Size and Shape**

If the Council wishes to protect the proposed skate egg concentration HAPCs, and VMS is the mechanism utilized to monitor closures of these areas, then the ideal minimum size according to the USCG and NOAA is approximately 5nm to a side. This is the minimum size that will provide sufficient buffer space in order to use VMS to determine an incursion into the area. The primary reason for this size would be to guarantee that at least one VMS poll is within the much finer area that the Council wishes to protect, and to ensure that vessels do not transit all the way through the area between polls, or merely cut through the corners. This minimum size will guarantee that the U.S. Coast Guard and the NOAA Office of Law Enforcement (OLE) would be able to get at least one VMS poll within the closed area despite issues of cutting the corner, or other means, and would ensure the smaller area is protected.

The distribution maps at each site of skate egg concentration (Appendix B – Color Figures 3-8) display two possible alternatives to determine the extent of the area, based on Alternatives 2 and 3. The red boundary is based on the distribution of trawl sites where skate eggs were greater than 1,000 km<sup>2</sup>, using the trawl with the highest concentration as the center of the box. The box design accomplishes two goals, that of estimating the effective habitat area and providing a small buffer around the site that produces a manageable area and shape to facilitate enforcement. The black boundary line expands the areas to comply with the recommendations of the Enforcement Committee.

At the February 2011 Council Meeting, the Enforcement Committee received a preliminary review of the six proposed skate HAPCs and made recommendations on the most appropriate shape and size. The Enforcement Committee recommended that the Council maintain square- or rectangular-shaped closures. Areas closed to certain gear types for conservation are more practical to enforce if they are square- or rectangle-shaped. It is more clear that a fishing vessel is either west/east or north/south of a delineation, and therefore in or outside a closed area using VMS or aircraft overflight. This clarity also benefits fishing vessels in avoiding or inadvertently entering a closure.

There have been no VMS-only cases that have stood up in court, unless the area has a no-transit provision, unless a cutter or aircraft was able to verify that fishing gear is in the water. This is done to ensure the vessel is actively engaged in fishing, and not merely transiting slowly through the area, or dealing with mechanical or weather issues that slow them down.

The Council has the option under Alternative 3 to prohibit nonpelagic gear, as this is the primary gear that would impact the area of skate egg concentration, but would allow pelagic trawl gear. In a February 2011 white paper prepared at the Council's request, the U.S. Coast Guard and NOAA discussed the enforcement and monitoring problems associated with closed areas that prohibit nonpelagic trawling but allow pelagic trawling. This is described in more detail in the above sections. The Committee's recommendation, if the Council wishes to identify HAPC areas around skate egg concentration sites *and* wishes to enforce protections, is to identify HAPC areas of a minimum size to allow effective VMS tracking for enforcement and to establish HAPC boundaries along latitude and longitude lines, wherever practical. Minimum thresholds should be established with a buffer of at least 1 nm beyond the boundary of the area to be protected in order to account for current VMS capabilities, potential GPS error, and the dislocation between vessels and deployed gear. Should the council decide to implement trawl gear restrictions for these areas, the Enforcement Committee recommends prohibition of all trawl activity in these areas.

#### **4.6 Net Benefits to the Nation**

Overall benefits to the Nation may be affected by the proposed actions, though our ability to quantify those effects is limited to a qualitative description, such potentially including increased ecosystem diversity. HAPCs are specific subsets of EFH that highlight specific areas with extremely important ecological functions and/or areas that are especially vulnerable to human-induced degradation. They are areas where fisheries management identifies a need to conserve sensitive, rare habitats from anthropogenic activities such as fishing practices or developmental stress. All stakeholders will benefit from enhanced sustainability of skate populations. Skate nurseries are ideal candidates for spatial management because they are fixed locations that are highly localized and will receive immediate benefits from elimination of bottom-contact commercial fishing. Designating these areas as HAPC is also consistent with the Council's emphasis on an ecosystem-based approach to fisheries management. However, overall net benefits to the Nation would not be expected to change to an identifiable degree between the alternatives under consideration ecological importance and sensitivity.

## 5.0 INITIAL REGULATORY FLEXIBILITY ANALYSIS (IRFA)

### 5.1 Introduction

This Initial Regulatory Flexibility Analysis (IRFA) addresses the statutory requirements of the Regulatory Flexibility Act (RFA) of 1980, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 (5 U.S.C. §§601-612). When an agency proposes regulations, the RFA requires the agency to prepare and make available for public comment an IRFA that describes the impact of the proposed rule on small businesses, small nonprofit entities, and small government entities. The IRFA is to aid the agency in considering all reasonable regulatory alternatives that would minimize the economic impact on the small entities to which the proposed rule applies. This IRFA evaluates the potential adverse economic impacts on small entities directly regulated by the proposed actions.

The 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: a) to increase agency awareness and understanding of the impact of their regulations on small business, b) to require that agencies communicate and explain their findings to the public, and c) 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 adverse economic impacts, while still achieving the stated objective of the action.

On March 29, 1996, President Clinton signed the SBREFA. 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 alleged 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.

### 5.2 IRFA Requirements

Until the Council makes a final decision on a preliminary preferred alternative(s) (PPA), a definitive assessment of the proposed management alternatives, within the context of the RFA, cannot be conducted. In order to allow the agency to make a certification decision, or to satisfy the requirements of an RFAA of the PPA, this section addresses the requirements for an IRFA. The level of detail and sophistication of the analysis should reflect the significance of the impact on small entities. Under 5 U.S.C. 603(b) of the RFA, each IRFA is required to address:

- 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 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.

In preparing an IRFA, an agency may provide either a quantifiable or numerical description of the effects of a proposed action (and alternatives to the proposed action), or more general descriptive statements, if quantification is not practicable or reliable.

### **5.3 Definition of a Small Entity**

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

#### **5.3.1 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 (SBA). “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% participation by foreign business entities in the joint venture.”

The SBA has established size criteria for all major industry sectors in the United States, including fish harvesting and fish processing businesses. Effective January 5, 2006, a business involved in fish harvesting is a small business if it is independently owned and operated, not dominant in its field of

operation (including its affiliates), and if it has combined annual gross receipts not in excess of \$4.0 million for all its affiliated operations worldwide.<sup>19</sup> 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 \$4.0 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: a) a person is an affiliate of a concern if the person owns or controls, or has the power to control 50 % 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 b) if two or more persons each owns, controls or has the power to control less than 50% 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 and subcontractor are treated as joint venturers 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.

### **5.3.2 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.

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<sup>19</sup> Effective January 6, 2006, the SBA updated the Gross Annual Receipts thresholds for determining “small entity” status under the RFA. This is a periodic action to account for the impact of economic inflation. The revised threshold for “commercial fishing” operations (which, at present, has been determined by NMFS HQ to include catcher-processors, as well as catcher vessels) changed from \$3.5 million to \$4.0 million in annual gross receipts, from all its economic activities and affiliated operations, worldwide.

### 5.3.3 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 fewer than 50,000.

## 5.4 Reasons for Consideration of Proposed Actions

In the Magnuson-Stevens Act (MSA), Congress recognized that one of the greatest long-term threats to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats. Congress adopted specific requirements for FMPs to identify Essential Fish Habitat (EFH) and minimize to the extent practicable any adverse effects of fishing on EFH. In the regulations implementing the EFH provisions of the Magnuson-Stevens Act, NMFS encourages Councils to identify types or areas of habitat within EFH as HAPCs (50 CFR 600.815(a)(8)). HAPCs provide a valuable mechanism to acknowledge areas where more is known about the ecological function and/or vulnerability of EFH, and to highlight priority areas within EFH for conservation and management. HAPCs and associated management measures considered by the Council would provide additional habitat protection and further minimize potential adverse effects of fishing on EFH. Such actions are consistent with the EFH Environmental Impact Statement (EIS), because they address potential impacts that are discussed in the EIS. In effect, through its evaluation of HAPCs, the Council is considering new measures that would be precautionary.

The Council adopted the following Statement of Purpose and Need at its February 2011 meeting:

*HAPCs are geographic sites that fall within the distribution of Essential Fish Habitat for the Council’s managed species. The Council has a formalized process, identified in its FMPs, for selecting HAPCs that begins with the Council identifying habitat priorities—here, areas of skate egg concentration. Candidate HAPCs must be responsive to the Council priority, must be rare (defined as uncommon habitat that occurs in discrete areas within only one or two Alaska regions), and must meet one of three other considerations: provide an important ecological function; be sensitive to human-induced degradation; or be stressed by development activities.*

*The candidate HAPCs identify sites of egg concentration by skate species (Rajidae) in the eastern Bering Sea. Skates are elasmobranch fish that are long-lived, slow to mature, and produce few young. Skates deposit egg cases in soft substrates on the sea floor in small, distinct sites. A reproducing skate deposits only several egg cases during each reproductive season. Depending on the species, a single egg case can hold from one to four individual skate embryos, and development can take up to three years. Thus, a single egg case site will hold several year classes and species, and eggs growing at different rates.*

*Distinct skate egg deposition sites have been highlighted by skate stock experts while assessing skate information from research survey and catch locations. The scientists noted repeated findings of distinct sites where egg cases recruit to sampling or fishing gear contacting the sea floor: egg case prongs (or horns) entangle in or cases recruits into the gear. The eggs and embryos are highly susceptible during their lengthy development to disturbance, damage, or destruction from fishing gear that contacts the sea floor. Fishing activities within these sites can also disrupt recently hatched juveniles and reproductive adult skates depositing new eggs in these sites. It is therefore important to protect areas of skate egg concentration and limit the loss of skates during its early life stages.*

## **5.5 Legal Basis for Proposed Actions**

Actions taken to amend FMPs or implement other regulations governing these fisheries must meet the requirements of federal laws and regulations. In addition to the Magnuson-Stevens Act, the most important of these are the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), EO 12866, and the RFA.

Under the Magnuson-Stevens Act (MSA), the U.S. has exclusive fishery management authority over all marine fishery resources found within the EEZ, 3 to 200 nautical miles from the baseline used to measure the territorial sea. The management of these marine resources is vested in the Secretary of Commerce (Secretary) and in the Regional Councils. In the Alaska Region, the North Pacific Fishery Management Council has the responsibility for preparing FMPs for the marine fisheries it finds that require conservation and management, and for submitting their recommendations to the Secretary. Upon approval by the Secretary, NMFS is charged with carrying out the federal mandates of the Department of Commerce with regard to marine and anadromous fish. The groundfish fisheries in the EEZ off Alaska are managed under the FMP for the Groundfish Fisheries of the GOA and the FMP for the Groundfish Fisheries of the BSAI. The crab fisheries in the EEZ off Alaska are managed under the FMP for the Crab Fisheries of the BSAI. The scallop fisheries in the EEZ off Alaska are managed under the FMP for the Scallop Fisheries of Alaska. The halibut fishery is managed by the International Pacific Halibut Commission (IPHC), which was established by a Convention between the governments of Canada and the United States. The IPHC's mandate is research on and management of the stocks of Pacific halibut within the Convention waters of both nations.

## **5.6 Small Entities Impacted by Actions**

Federal courts and Congress have indicated that an RFAA analysis should be limited to small entities directly regulated by the proposed regulation. As such, small entities to which implementing regulations would not apply are not considered in this analysis. The entities that could be directly regulated by the proposed action are those businesses that use certain gear types to harvest groundfish, halibut, crab, scallops, and other fishery resources in the waters off of Alaska. The proposed action would not apply to any small governmental jurisdiction or small organization as defined by the RFA.

## **5.7 Recordkeeping and Reporting Requirements**

The proposed rule does not directly mandate “reporting” or “record keeping” within the meaning of the Paperwork Reduction Act (PRA). However, implementing rules could contain compliance requirements not subject to the PRA. For example, implementing regulations could prohibit the use of certain types of fishing gear in habitat areas designated as HAPCs.

Of those vessels that could be directly regulated, only a small fraction would incur compliance costs as a result of the implemented rule. In many cases, it is likely that any displaced catch would be made up by shifting effort to another area. Given the low level of revenue at risk under the proposed rule, the potential increase in vessel operating costs would also likely be small. On this basis, implementing regulations should not be expected to have the potential to adversely affect the cash flow or profitability of any small entities. Implementation of these alternatives would potentially mean that fishing vessels actively fishing in the areas under consideration for HAPC designation would be subject to NMFS recordkeeping and reporting requirements for as long as they hold an FFP.

## **5.8 Duplicate, Overlap, or Conflict with Federal Rules**

No relevant Federal rules have been identified that would duplicate, overlap, or conflict with the proposed action.

## **5.9 Alternatives that Accomplish Objectives at Lower Cost to Small Entities**

Though technically, this section cannot be completed until the Council has selected its PPA, an IRFA also requires a description of any significant alternatives to the proposed action(s) that accomplish the stated objectives, are consistent with applicable statutes, and that would minimize any significant economic impact of the proposed rule on small entities. All of the directly regulated entities under this action are considered small entities, as defined under the RFA. Within the universe of small entities that would be directly regulated by this action, impacts may accrue differently (i.e., some small entities may be negatively affected, while others may be positively affected). Thus, the action represents tradeoffs in terms of impacts on small entities. Based upon the best available scientific data, and consideration of the objectives of this action, it appears that there are no alternatives to the proposed action that have the potential to accomplish the stated objectives of the Magnuson-Stevens Act and any other applicable statutes, and have the potential to minimize any significant adverse economic impact of the proposed rule on small entities.

## 6.0 CONSISTENCY WITH APPLICABLE LAW

This section examines the consistency of HAPC designation for areas of skate egg concentration with a Finding of No Significant Impact (FONSI), the ten National Standards, and Fishery Impact Statement (FIS), requirements of the National Environmental Policy Act (NEPA), the Magnuson-Stevens Act (MSA), and Executive Order (EO) 12866.

### 6.1 Environmental Analysis Conclusions

One of the purposes of an environmental assessment (EA) is to provide the evidence and analysis necessary to decide whether an agency must prepare an environmental impact statement (EIS). The Finding of No Significant Impact (FONSI) is the decision maker's determination that the action will not result in significant impacts to the human environment, and therefore, further analysis in an EIS is not needed. The Council on Environmental Quality regulations at 40 CFR 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." An action must be evaluated at different spatial scales and settings to determine the context of the action. Intensity is evaluated with respect to the nature of impacts and the resources or environmental components affected by the action. NOAA Administrative Order (NAO) 216-6 provides guidance on the National Environmental Policy Act (NEPA) specifically to line agencies within NOAA. It specifies the definition of significance in the fishery management context by listing criteria that should be used to test the significance of fishery management actions (NAO 216-6 §§ 6.01 and 6.02). These factors form the basis of the analysis presented in this EA/RIR/IRFA. The results of that analysis are summarized here for those criteria.

**Context:** For this action, the setting is the eastern Bering Sea, primarily within the BSAI groundfish fisheries that participate in the specific areas of the EBS that are proposed for identification as a HAPC and gear limitations. Any effects of this action are limited to these areas, or areas immediately adjacent in the EBS where vessels may choose to catch their target fish if they are closed out of specific fishing areas. The effects of this action on society within this area are on individuals directly and indirectly participating in these fisheries and on those who use the ocean resources. Because this action concerns the use of a present and future resource, this action may have impacts on society as a whole or regionally.

**Intensity:** Considerations to determine intensity of the impacts are set forth in 40 CFR 1508.27(b) and in the NAO 216-6, Section 6. Each consideration is addressed below in order as it appears in the NMFS Instruction 30-124-1 dated July 22, 2005, *Guidelines for Preparation of a FONSI*.

1) *Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?*

No. No significant adverse impacts on target species were identified for Alternatives 2 or 3. No changes in overall amount or timing of harvest of target species are expected with any of the alternatives or options in the proposed action, and the general location of harvest is also likely to be similar to the status quo, although there may be localized shifts. Therefore, no impacts on the sustainability of any target species are expected.

2) *Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species?*

No. Potential effects of Alternatives 2 and 3 on non-target and prohibited species are expected to be insignificant and similar to status quo because no overall harvest changes to target species were expected. Some benefit to skate eggs caught as bycatch in the groundfish fisheries may accrue due to the area closures. Because no overall changes in target species harvests under the alternatives is expected, the alternatives and option are not likely to jeopardize the sustainability of any non-target/prohibited species.

3) *Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in the fishery management plans?*

No. No significant adverse impacts were identified for Alternatives 2 or 3 on ocean or coastal habitats or EFH. The alternatives provide additional protection to areas in the EBS where area closures and gear limitations are proposed. Alternative 2 is less protective of habitat than Alternative 3 because it only designates areas as HAPCs without gear limitations for conservation of habitat and skate egg concentrations.

4) *Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety?*

No. Public health and safety will not be affected in any way not evaluated under previous actions or disproportionately as a result of the proposed action. The proposed action for Alternatives 2 and 3 will not change overall fishing methods, timing of fishing, or quota assignments to gear groups, which are based on previously established seasons and allocation formulas in regulations.

5) *Can the proposed action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?*

No. The proposed action would not change the Steller sea lion protection measures, ensuring the action is not likely to result in adverse effects not already considered under previous ESA consultations for Steller sea lions and their critical habitat. The area adjacent to these closures, into which fishing vessels may be displaced, is not identified as critical habitat for any ESA-listed species and population level effects are not expected. Because there is not expected to be any change in overall harvests, none of the alternatives are likely to adversely affect ESA-listed species or their designated critical habitat.

6) *Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?*

No significant adverse impacts on biodiversity or ecosystem function were identified for Alternatives 1 through 3. Alternative 3 would provide protection to biodiversity and ecosystem function by creating area closures in the EBS, and likely benefit marine features that provide an ecosystem function. No significant effects re expected on biodiversity, the ecosystem, marine mammals, or seabirds

7) *Are significant social or economic impacts interrelated with natural or physical environmental effects?*

Socioeconomic impacts of this action could result from *de minimis* displacement of vessels that make contact with the sea floor while fishing in the proposed area closures, or additional costs associated with the options that would allow them to be exempted from the closures. The social or economic impacts of the alternatives are not expected to be significant as target fish are harvested in areas immediately adjacent to the proposed closure areas, and meeting the requirements for the exemptions are not excessively expensive to the fishing fleet.. No significant adverse impacts were identified for Alternatives 1 through 3 for social or economic impacts interrelated with natural or physical environmental effects.

8) *Are the effects on the quality of the human environment likely to be highly controversial?*

No. This action is limited to specific areas in the EBS that are historically of some and limited value to the groundfish fleet. Development of the proposed action has involved participants from the scientific and fishing communities, and the potential impacts on the human environment are well understood. No issues of controversy were identified in the process.

9) *Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?*

No. This action would not affect any categories of areas on shore. This action takes place in the geographic area of the EBS. The land adjacent to this marine area may contain archeological sites of native villages, but this action would occur in adjacent marine waters so no impacts on these cultural sites are expected. The marine waters where the fisheries occur contain ecologically critical areas. Effects on the unique characteristics of these areas are not anticipated to occur with this action because of the amount of fish removed by vessels are within the total allowable catch (TAC) specified harvest levels and the alternatives provide protection to EFH and ecologically critical areas at the heads of undersea canyons.

10) *Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?*

No. The potential effects of the action are well understood because of the fish species, harvest methods involved, and area of the activity. For marine mammals and seabirds, enough research has been conducted to know about the animals' abundance, distribution, and feeding behavior to determine that this action is not likely to result in population effects. The potential impacts of different gear types on habitat also are well understood, as described in the EFH EIS (NMFS 2005).

11) *Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?*

No. Beyond the cumulative impact analyses in the 2011 and 2012 harvest specifications EA and the Groundfish Harvest Specifications EIS, no other additional past or present cumulative impact issues were identified. Reasonably foreseeable future impacts in this analysis include potential effects of climate change due to global warming. The combination of effects from the cumulative effects and this proposed action are not likely to result in significant effects for any of the environmental component analyzed and are therefore not significant.

12) *Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources?*

No. 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. Because this action occurs in marine waters, this consideration is not applicable to this action.

13) *Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?*

No. This action poses no effect on the introduction or spread of nonindigenous species into the Bering Sea and Aleutian Islands beyond those previously identified because it does not change fishing, processing, or shipping practices that may lead to the introduction of nonindigenous species.

14) *Is the proposed action likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?*

No. This action would provide additional protections for North Pacific skate species by designating areas of skate egg concentration as HAPCs, implementing conservation and management measures, and

research and monitoring these areas in the EBS. This action does not establish a precedent for future action because the Council has indicated that a HAPC priority exists exclusively for the duration of a Council HAPC proposal cycle. Thus, HAPC site proposals for a previously-designated HAPC priority may not be submitted on a continuing basis. In addition, HAPC designation has been used as a management tool for the protection of marine resources in the Alaska groundfish fisheries. Pursuant to NEPA, for all future actions, appropriate environmental analysis documents (EA or EIS) will be prepared to inform the decision makers of potential impacts to the human environment and to implement mitigation measures to avoid significant adverse impacts.

*15) Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law, or requirements imposed for the protection of the environment?*

No. This action poses no known violation of Federal, State, or local laws, or requirements for the protection of the environment. The proposed action would be conducted in a manner consistent, to the maximum extent practicable, with the enforceable provisions of the Alaska Coastal Management Program within the meaning of Section 30(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.<sup>20</sup>

*16) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?*

No. The effects on target and non-target species from the alternatives are not significantly adverse as the overall harvest of these species will not be affected. No cumulative effects were identified that added to the direct and indirect effects on target and non-target species would result in significant effects.

### **6.1.1 Comparison of Alternatives**

Alternative 1 is the status quo, calls for no action, and does not provide for protection of habitat supporting skate egg concentration areas on the sea floor from fishing activities or fishing gear that make contact with the sea floor in these areas of the EBS. No measures would be taken to designate and conserve areas of skate egg concentration as HAPCs. Under Option e, however, the Council may add research and monitoring of these areas of skate egg concentration to the Council's annual research priority list. Thus, Alternative 1 has no significant impacts identified and or potential beneficial socioeconomic effects.

Alternative 2 would provide for a degree of protection for areas of skate egg concentration from fishing activities by designating areas of supporting habitat as HAPCs, highlighting their existence to the fishing fleets, which could voluntarily avoid those areas or prevent their fishing gear from making contact with the sea floor. The Council may select individually, severally, or all of the six areas identified as potential skate egg concentration HAPCs. Alternative 2 has no additional environmental impacts beyond those already identified in the analysis, but Alternative 2 would not provide for additional protections by limiting the use of fishing gear that makes contact with the sea floor. Alternative 2 has no significant impacts identified and potential beneficial socioeconomic effects.

Alternative 3 provides for both the identification of skate egg concentration HAPCs and for the conservation of these areas through prohibitions of gear types that make contact with the sea floor. The impacts of Alternative 3 depend on the option for conservation and management (a through d) selected for each HAPC. The Council may select, in combination with any skate egg concentration designated as a HAPC, to limit fishing activities that make contact with the sea floor in these areas by prohibiting the use

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The Alaska Coastal Management Program expired July 1, 2011 (AS 44.66.030). The State Legislature adjourned its special legislative session May 14, 2011 without passing legislation required to extend the Coastal Program.

of “mobile bottom contact,” pelagic, “bottom contact,” or all fishing gear. Options that prohibit trawling in these areas would provide the most protection from potential direct impacts (bury or crush) and indirect impacts (dislodgement, movement, bycatch mortality) on egg cases. Other gear types likely have less potential to impact skate egg cases, so a prohibition on these gears may offer only marginal benefits. The potential effects of the options on skate populations remains unknown but are likely beneficial.

## **6.2 The Ten National Standards**

Below are the ten National Standards as contained in the MSA and a brief discussion of the consistency of the proposed alternatives with each of those National Standards, as applicable (MSA 301(a)).

**National Standard 1:** *Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery.*

None of the alternatives considered in this action would result in overfishing in the EBS or of groundfish in the BSAI. The alternatives would also not impact, on a continuing basis, the ability to achieve the optimum yield from EBS fisheries or the BSAI groundfish fishery.

**National Standard 2:** *Conservation and management measures shall be based upon the best scientific information available.*

The analysis for this action is based upon the best and most recent scientific information available. The National Standard Guidelines for FMPs require that a stock assessment and fishery evaluation (SAFE) report be prepared and reviewed annually for each fishery management plan (FMP). Applicable here and utilized in this analysis is the December 2011 SAFE for the *Groundfish Resources of the Bering Sea/Aleutian Islands Regions*. The SAFE report summarizes the best available scientific information concerning the past, present, and possible future condition of the stocks (here, skates), marine ecosystems, and fisheries that are managed under Federal regulation. It provides information to the Councils for determining annual harvest levels from each stock, documenting significant trends or changes in the resource, marine ecosystems, and fishery over time, and assessing the relative success of existing state and Federal fishery management programs.

In addition, this analysis incorporates policies from the 2004 PSEIS for the groundfish fisheries management programs that are ecosystem-based and more precautionary when faced with scientific uncertainty. During staff tasking at its February 2012 meeting, the Council discussed the schedule for review of the groundfish PSEIS and will receive a report back from NMFS staff at its April 2012 meeting. Until the current PSEI is reviewed, revised, and adopted, the 2004 PSEIS remains the best scientific information available to evaluation of alternative groundfish fishery management programs on the human environment.

**National Standard 3:** *To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.*

The proposed action is consistent with the management of individual stocks as a unit or interrelated stocks as a unit or in close coordination.

**National Standard 4:** *Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be (A) fair and equitable to all such fishermen, (B) reasonably calculated to promote conservation, and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.*

The proposed alternatives treat all fishing vessels the same. The proposed alternatives would be implemented without discrimination among participants and are intended to promote conservation of North Pacific skate species in the EBS

**National Standard 5:** *Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources, except that no such measure shall have economic allocation as its sole purpose.*

This action will potentially improve efficiency in utilization of the fishery resources in the EBS and the BSAI groundfish fishery by highlighting areas in which there is a very high likelihood that skate egg casings will be encountered.

**National Standard 6:** *Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.*

None of the proposed alternatives is expected to affect the availability of and variability in the groundfish resources in the BSAI in future years.

**National Standard 7:** *Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.*

This action does not duplicate any other management action.

**National Standard 8:** *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.*

This action is not expected to have adverse impacts on communities or affect community sustainability.

**National Standard 9:** *Conservation and management measures shall, to the extent practicable, (A) minimize bycatch, and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*

The proposed action is expected to reduce the impact of bycatch and bycatch mortality of skate egg casings primarily in the BSAI groundfish fishery.

**National Standard 10:** *Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.*

The proposed action is not expected to have a substantial impact on safety at sea.

### **6.3 Fisheries Impact Statement (FIS)**

Section 303(a)(9) of the Magnuson-Stevens Act requires that any management measures submitted by the Council take into account the potential impacts on the participants in the affected fisheries, as well as participants in adjacent fisheries. The impacts on participants in the BSAI groundfish, crab, and scallop fisheries have been discussed in previous sections of this document. The proposed alternatives are not anticipated to have effects on participants in other fisheries.



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## **8.0 PREPARERS, CONTRIBUTORS, AND PERSONS CONSULTED**

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## 9.0 APPENDICES

### 9.1 Appendix A – HAPC Process Methodology

#### Methodology for Proposal Evaluation

##### Evaluation Criteria

The Council has determined, through the HAPC identification process defined in the Council FMPs, that HAPCs in Alaska must be geographic sites that are rare AND must meet one of three other considerations: (1) provide an important ecological function; (2) be sensitive to human-induced degradation; or (3) be stressed by development activities. To provide guidance to proposers and reviewers about how proposals should be evaluated against these considerations, the Council adopted the following criteria:

1. In order to be considered rare, proposals should meet the criteria identified in a score of “2” or “3.”
2. For the other three factors, a score of “0” indicates that a proposal does not meet the particular consideration in question.

**Table 36. Criteria to evaluate HAPC proposals for the Council’s consideration**

Score	HAPC Considerations			
	Rarity	Ecological Importance	Sensitivity	Level of Disturbance (applicable to activities other than fishing)
	<i>The rarity of the habitat type.</i>	<i>The importance of the ecological function provided by the habitat</i>	<i>The extent to which the habitat is sensitive to human induced environmental degradation</i>	<i>Whether and to what extent development activities are or will be stressing the habitat type</i>
0	N/A	Habitat does not provide any ecological associations <sup>21</sup> for managed species.	Habitat resilient (not sensitive).	Habitat not subject to developmental stress.
1	N/A	Habitat provides little structure <sup>22</sup> or refugia. Foraging and spawning areas do not exist.	Habitat somewhat sensitive and quickly recovers; 1- 5 years. Effects considered temporary.	Habitat is or will be exposed to minimal disturbance from development.
2	Habitat uncommon, less frequent, and occurs to some extent in one or two of the Alaska regions: Gulf of Alaska, Bering Sea, Aleutian Islands, and Arctic.	Habitat exhibits structure and provides refugia or substrates for spawning and foraging.	Habitat sensitive and recovery is within ten years. Effects considered temporary; may be more than minimal, however.	Habitat is or will be stressed by activities. Short term effects evident.
3	Habitat uncommon and occurs in discrete areas within only one Alaska region.	Complex habitat condition and substrate serve as refugia, concentrate prey, and/or are known to be important for spawning.	Habitat is highly sensitive and slow to recover; exceeds 10s of years. Effects will persist and more than minimal.	Habitat is or will be severely stressed or disturbed by development. Cumulative impacts require consideration from long term effects.

##### Data Certainty Factor

<sup>21</sup> Ecological associations are those associations where the habitat provides for reproductive traits (i.e. spawning and rearing aggregations) and foraging areas; areas necessary for survival of the species. Associations include habitat complexity (features, structures, etc.) and habitat associations (provide refugia, spawning substrates, concentrate prey, etc.). Ecological importance is not to be applied across all waters or substrates.

<sup>22</sup> “Structure” refers to three-dimensional structure.

The Data Certainty Factor (DCF) determines the level of information known to describe and assess the HAPC site. The DCF is used to determine if information is adequate prior to taking further action. Thus, a HAPC proposal with a high criteria score and a low DCF is to be highlighted (flagged) as a potential candidate for HAPC and for further consideration as a research priority. In this HAPC cycle, the DCFs are scored according to their weight to further inform the criteria scores, i.e., a DCF of 3, 2, or 1.

**Table 37. The Data Certainty Factor (DCF)**

<b>Weight</b>	<b>Data Certainty</b>
3	Site-specific habitat information is available.
2	Habitat information can be inferred or proxy conditions allow for information to be reliable.
1	Habitat information does not exist; neither by inference nor proxy.
N/A	Research Priority Flag – as applicable.

### **HAPC Proposal Rank**

The HAPC ranking formula provides a score (sum of criteria scores) to provide information on the proposal as it is considered by the Council in the HAPC process. A highly ranked HAPC proposal with a DCF of 3 has a high criteria score AND information exists to assess the site. High scoring proposals with a low data certainty factor may warrant consideration as a research priority:

*HAPC Proposal Rank = Additive HAPC Criteria Score supplemented with Data Certainty Factor*

### **Methodology for Selection**

#### **Plan Teams' Review**

At their September 2010 meeting, the Joint Groundfish Plan Teams reviewed the HAPC proposals for ecological merit. The joint plan teams found merit to the proposals, recognizing that there will always be some level of scientific uncertainty in the design of proposed HAPCs and how they meet the criteria and stated goals and objectives. The plan teams highlighted: low population growth rate of skates; the long development time for skate embryos, during which they are vulnerable to fishing gear that contacts the sea floor; and the relatively high level of production provided by small geographic areas of the eastern Bering Sea. The joint plan teams also encouraged allocation of research funds to monitor the effectiveness of the protection measures for skate embryos.

### **Evaluation of Proposed Sites Using HAPC Criteria**

**Table 38. HAPC Evaluation Criteria**

	<b>HAPC Considerations</b>			
	<b>Rarity</b>	<b>Ecological Importance</b>	<b>Sensitivity</b>	<b>Level of Disturbance</b> (applicable to activities other than fishing)
	<i>The rarity of the habitat type.</i>	<i>The importance of the ecological function provided by the habitat</i>	<i>The extent to which the habitat is sensitive to human induced environmental degradation</i>	<i>Whether and to what extent development activities are or will be stressing the habitat type</i>
<b>Score</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>

<b>Description</b>	<b>Habitat uncommon, less frequent, and occurs to some extent in one or two of the Alaska regions: Gulf of Alaska, Bering Sea, Aleutian Islands, and Arctic.</b>	<b>Complex habitat condition and substrate serve as refugia, concentrate prey, and/or are known to be important for spawning.</b>	<b>Habitat sensitive and recovery is within ten years. Effects considered temporary; may be more than minimal, however.</b>	<b>Habitat is or will be exposed to minimal disturbance from development.</b>
<b><u>Proposed HAPCs' Responsiveness to HAPC Considerations</u></b>				
<b>Responsiveness</b>	The current state of knowledge indicates that skate nursery sites are very rare. The HAPC areas proposed here constitute only 280 km <sup>2</sup> total, compared to an estimated area of 495,218 km <sup>2</sup> for the eastern Bering Sea.	Skate nursery sites are distinct benthic habitat sites used for skate egg case deposition and embryo development. Nursery sites concentrate multiple cohorts of early life stages that are highly vulnerable, as well as reproductive adult skates. As a result, they are extremely important for the sustainability of skate populations and have great ecological significance.	Skate egg cases and the embryos they contain are sensitive to being dislodged, damaged, destroyed, or captured by fishing gear contacting the sea floor. Fishing also increases the mortality risk to reproductive adults in nursery sites.	Development is unlikely to affect the six nursery sites identified.

### Ranking of Proposed HAPCs

The HAPC ranking formula provides a score (sum of criteria scores) to provide information on the proposal as it is considered by the Council in the HAPC process. The HAPC Proposal Rank is the additive HAPC Criteria Score supplemented with the Data Certainty Factor (DCF). DCF determines the level of information known to describe and assess the HAPC sites. Here, detailed and site-specific habitat information is available—in 2009, an AUV was used to map parts of four nurseries using a high-resolution camera (Hoff *et al* 2010).

**Table 39. Evaluation of HAPC proposal**

<b>HAPC Evaluation</b>	<b>Proposal Score</b>
Rarity*	2
Ecological importance	3
Sensitivity	2
Stress / disturbance	1
<b>Criteria Score Total (+)</b>	<b>8</b>
Data Certainty Factor	3
<b>HAPC Proposal Rank (=)</b>	<b>11</b>
Research Priority Flag	N/A

\* Proposals must meet the rarity consideration.

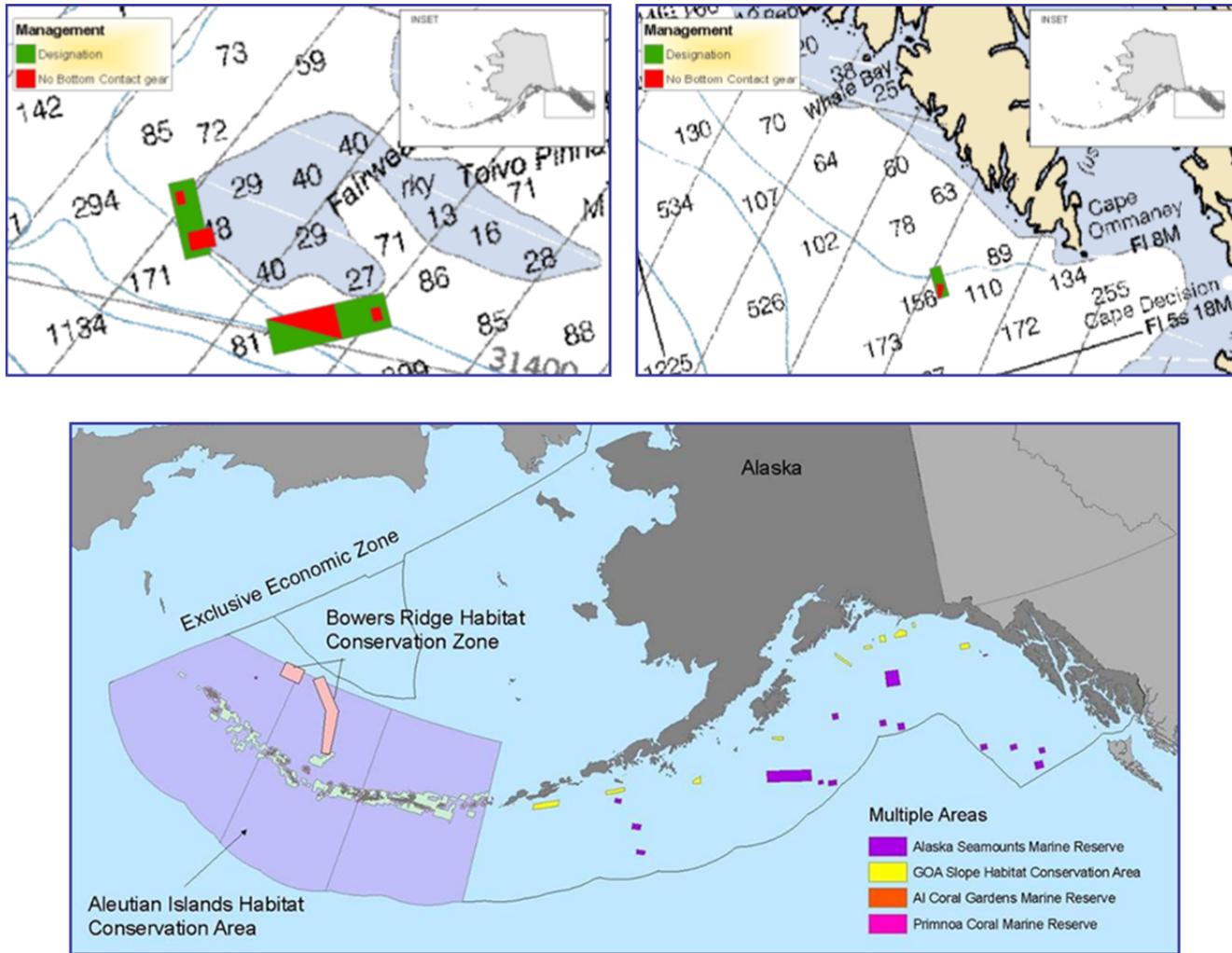
## 9.2 Appendix B – Color Figures

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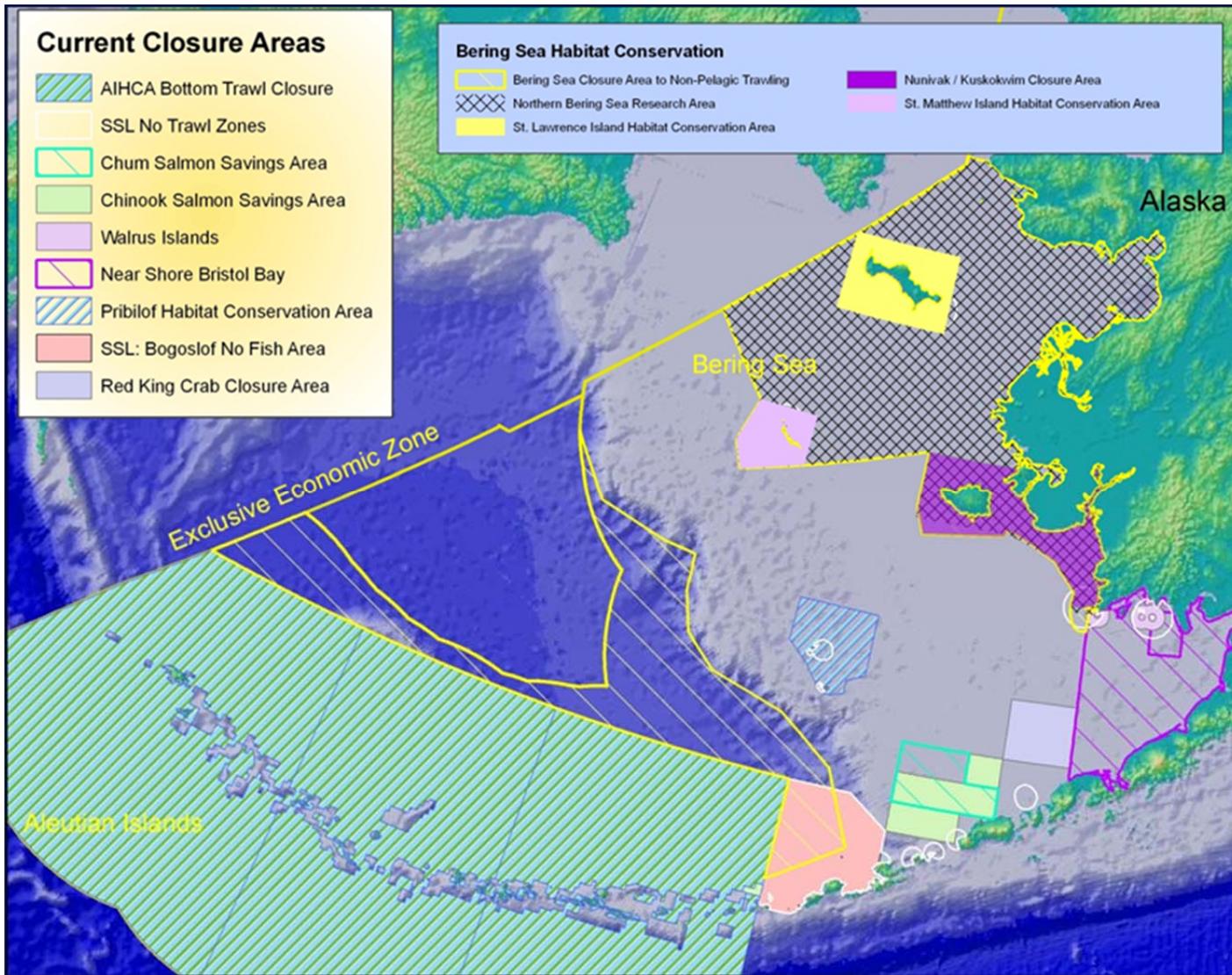
### List of Color Figures

Figure 1. Locations of current HAPC.....	3
Figure 2. Current conservation and bottom trawl closure areas.....	4
Figure 3. Bering 1 HAPC site.....	5
Figure 4. Bering 2 HAPC site.....	5
Figure 5. Bristol HAPC site.....	6
Figure 6. Pribilof HAPC site.....	6
Figure 7. Zhemchug HAPC site.....	7
Figure 8. Pervenets HAPC site.....	7
Figure 9. Alaska skate egg density in Bering 1 and 2.....	8
Figure 10. Aleutian skate egg density in Bering 1 and 2.....	9
Figure 11. Bering skate egg density in Bering 1 and 2.....	10
Figure 12. Total skate egg density in Bering 1 and 2.....	11
Figure 13. Alaska skate egg density in Bristol.....	12
Figure 14. Aleutian skate egg density in Bristol.....	13
Figure 15. Bering skate egg density in Bristol.....	14
Figure 16. Total skate egg density in Bristol.....	15
Figure 17. Alaska skate egg density in Pervenets.....	16
Figure 18. Aleutian skate egg density in Pervenets.....	17
Figure 19. Bering skate egg density in Pervenets.....	18
Figure 20. Total skate egg density in Pervenets.....	19
Figure 21. Alaska skate egg density in Zhemchug.....	20
Figure 22. Aleutian skate egg density in Zhemchug.....	21
Figure 23. Bering skate egg density in Zhemchug.....	22
Figure 24. Total skate egg density in Zhemchug.....	23
Figure 25. Skate egg concentration areas CPUE under Alternative 3.....	24
Figure 26. Skate egg concentration areas with observed nonpelagic trawl, 1990-2005.....	25
Figure 27. Observed nonpelagic trawl skate bycatch, 2000-2011.....	26
Figure 28. Observed nonpelagic trawl skate egg bycatch, 2000-2011.....	27
Figure 29. Observed nonpelagic trawl skate egg bycatch, 1998-2011.....	28
Figure 30. Skate egg concentration areas with observed pelagic trawl, 1990-2005.....	29
Figure 31. Observed pelagic trawl skate bycatch, 2000-2005.....	30
Figure 32. Observed pelagic trawl skate bycatch, 2006-2011.....	31
Figure 33. Observed pelagic trawl skate egg bycatch, 1998-2011.....	32
Figure 34. Observed pelagic trawl skate egg bycatch, 1998-2011.....	33
Figure 35. Observed pelagic trawl, 1990-2005, Bering 1 and 2.....	34
Figure 36. Longline sets, 1998-2010.....	35
Figure 37. Observed longline skate egg bycatch, 1998 -2011.....	36
Figure 38. Pot lifts, 1998-2010.....	37
Figure 39. Seafloor within areas of skate egg concentration.....	38
Figure 40. Delineation of boundaries under Alternative 2.....	39
Figure 41. Detail of Bering 1 and 2.....	39
Figure 42. Detail of Bristol.....	40
Figure 43. Detail of Pribilof.....	40
Figure 44. Detail of Zhemchug.....	41
Figure 45. Detail of Pervenets.....	41
Figure 46. Possible areas of skate egg concentration.....	42
Figure 47. Skate eggs in trawl and expansion to egg density.....	43
Figure 48. Egg densities from all trawls in areas of skate egg concentration.....	43

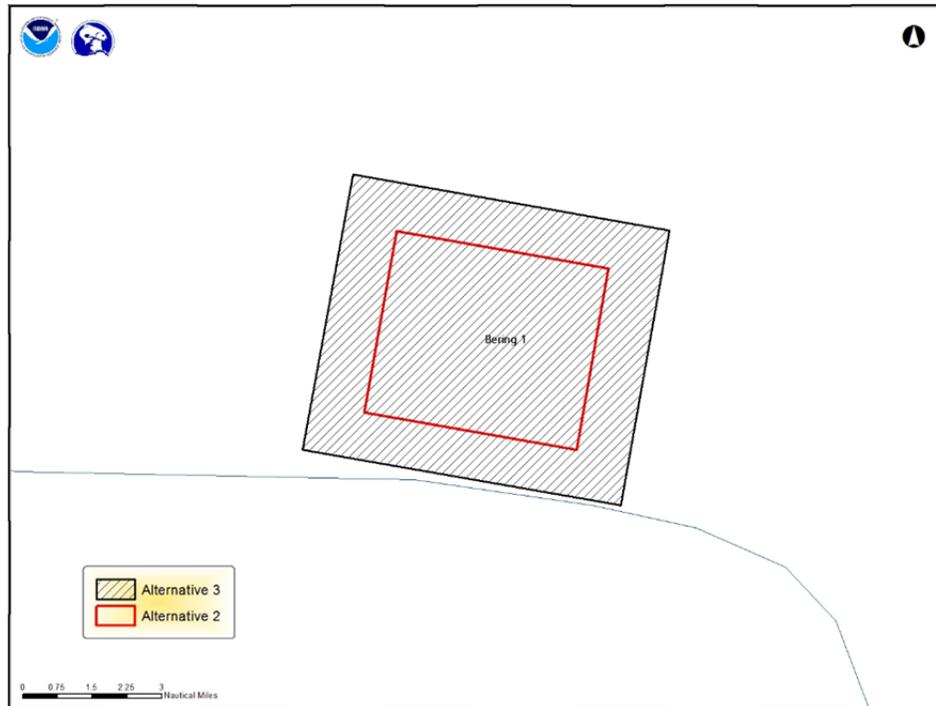
Figure 49. Embryo length frequencies.....	44
Figure 50. Depth and temperature relationship with latitude.....	45
Figure 51. Seafloor within Pribilof and Pervenents .....	46
Figure 52. Skate species composition .....	47
Figure 53. Abundance of skate species by depth. ....	47
Figure 54. Skate biomass distribution, 2004-2010. ....	48
Figure 55. Trawl survey catches of Alaska skate, 2007-2008 .....	49
Figure 56. Trawl survey catches of Bering skate, 2007-2008.....	50
Figure 57. Map of six known areas of skate egg concentraion.....	51
Figure 58. Embryo length used in cohort analysis of embryo development time.....	51
Figure 59. Ocean temperature versus skate embryo development time.....	52
Figure 60. Total skate catch, 2003-2011.....	52
Figure 61. Observed biomass from eastern Bering Sea shelf surveys, 1992-2011.....	53
Figure 62. Expected recruitment with individual year class estimates. ....	53
Figure 63. Relationship between female spawning biomass and age 0 recruits .....	54
Figure 64. Estimates for total and female spawning biomass. ....	54
Figure 65. Skate biomass from surveys, 1975-2011 .....	55
Figure 66. Bering Sea Habitat Conservation Area.....	56
Figure 67. Northern Bering Sea Research and Saint Lawrence Island Habitat Conservation Areas(a) .....	57
Figure 68. Northern Bering Sea Research and Saint Lawrence Island Habitat Conservation Areas(b). ....	58
Figure 69. Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area.....	59



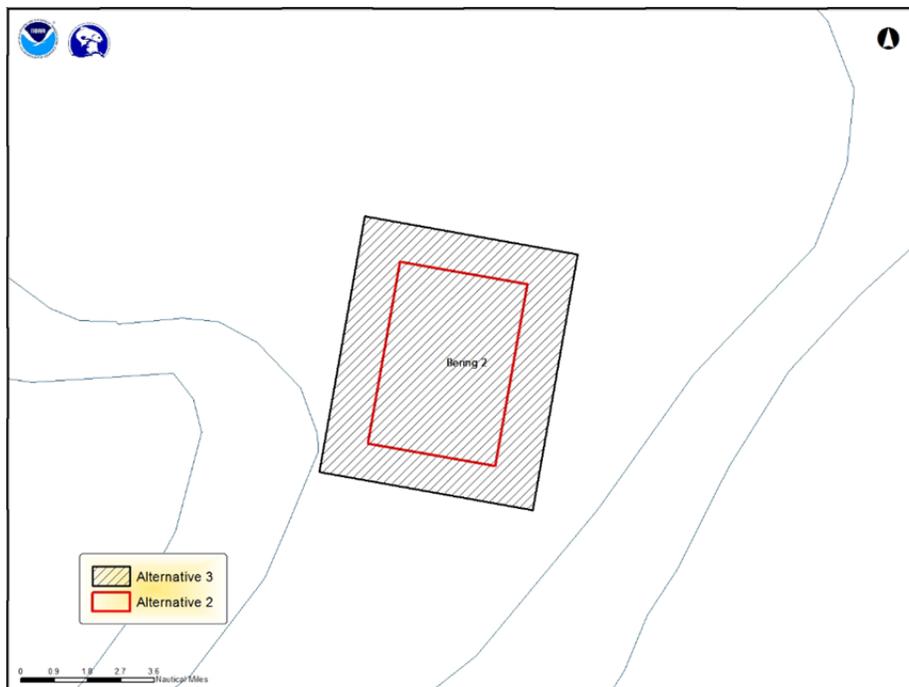
**Figure 1. Locations of current HAPC areas.**  
 Source: NPFMC.



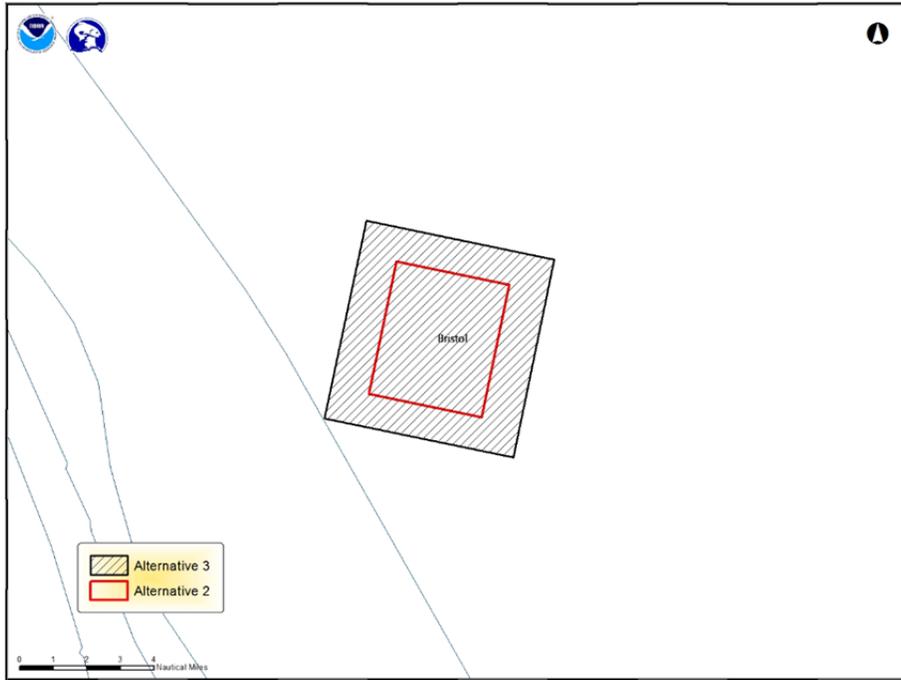
**Figure 2. Current eastern Bering Sea habitat conservation areas and bottom trawl closure areas.**  
 Source: NPFMC.



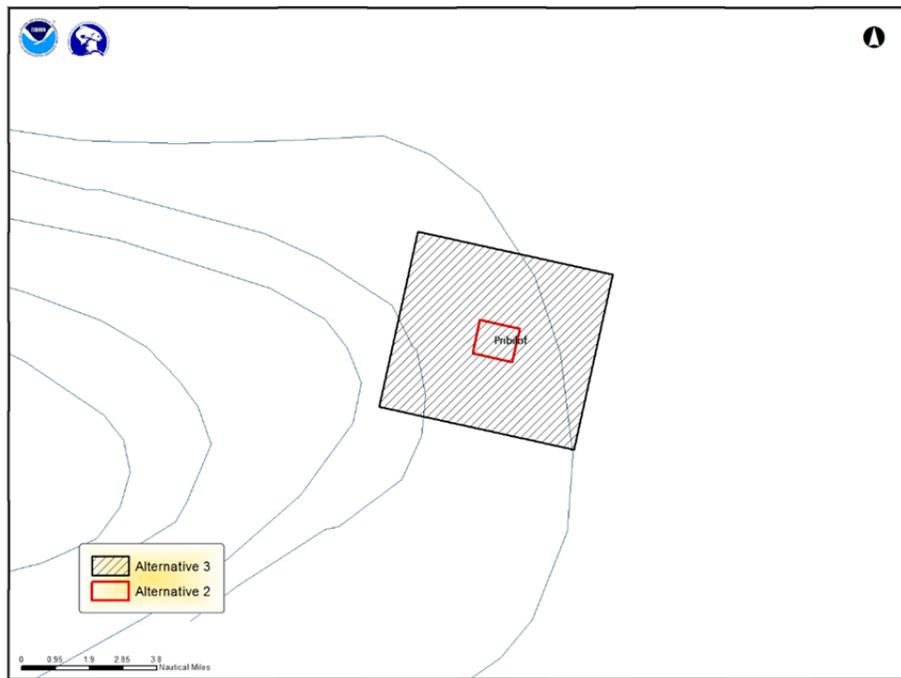
**Figure 3. Bering 1 site under Alternative 2 (18.4 nm<sup>2</sup>, red boundary) and Alternative 3 (41.8 nm<sup>2</sup>, black boundary).  
Source: NMFS HCD.**



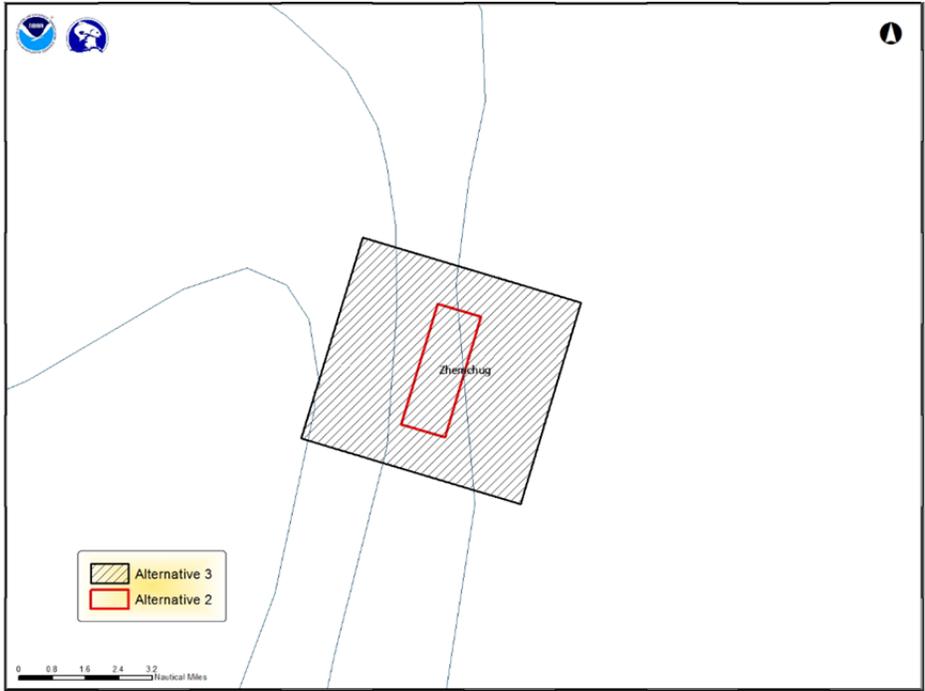
**Figure 4. Bering 2 site under Alternative 2 (17.5 nm<sup>2</sup>, red boundary) and Alternative 3 (40.9 nm<sup>2</sup>, black boundary).  
Source: NMFS HCD.**



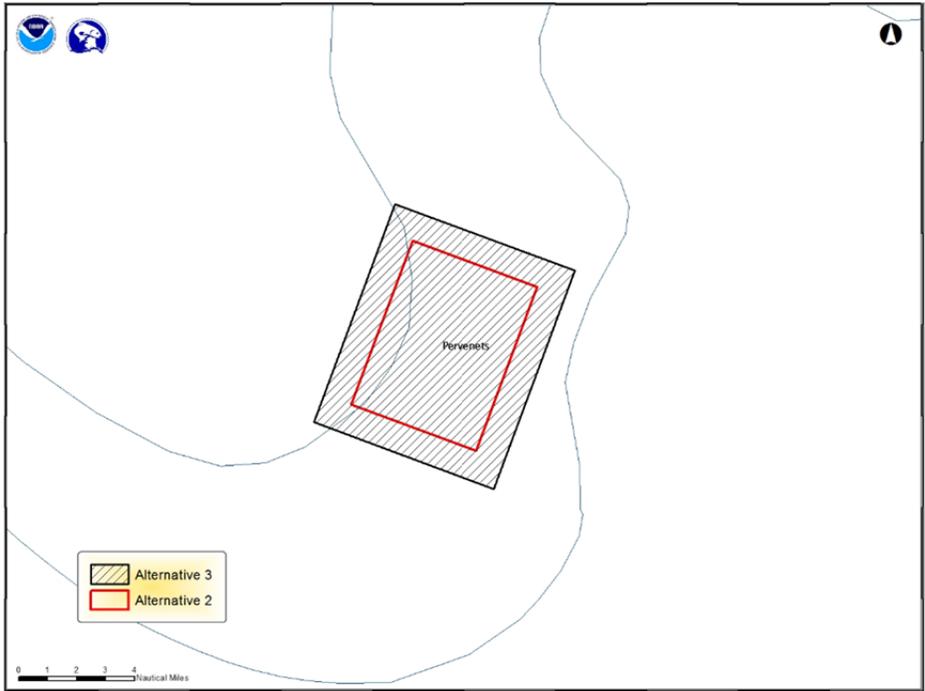
**Figure 5. Bristol site under Alternative 2 (13.7 nm<sup>2</sup>, red boundary) and Alternative 3 (34.4nm<sup>2</sup>, black boundary).**  
**Source: NMFS HCD.**



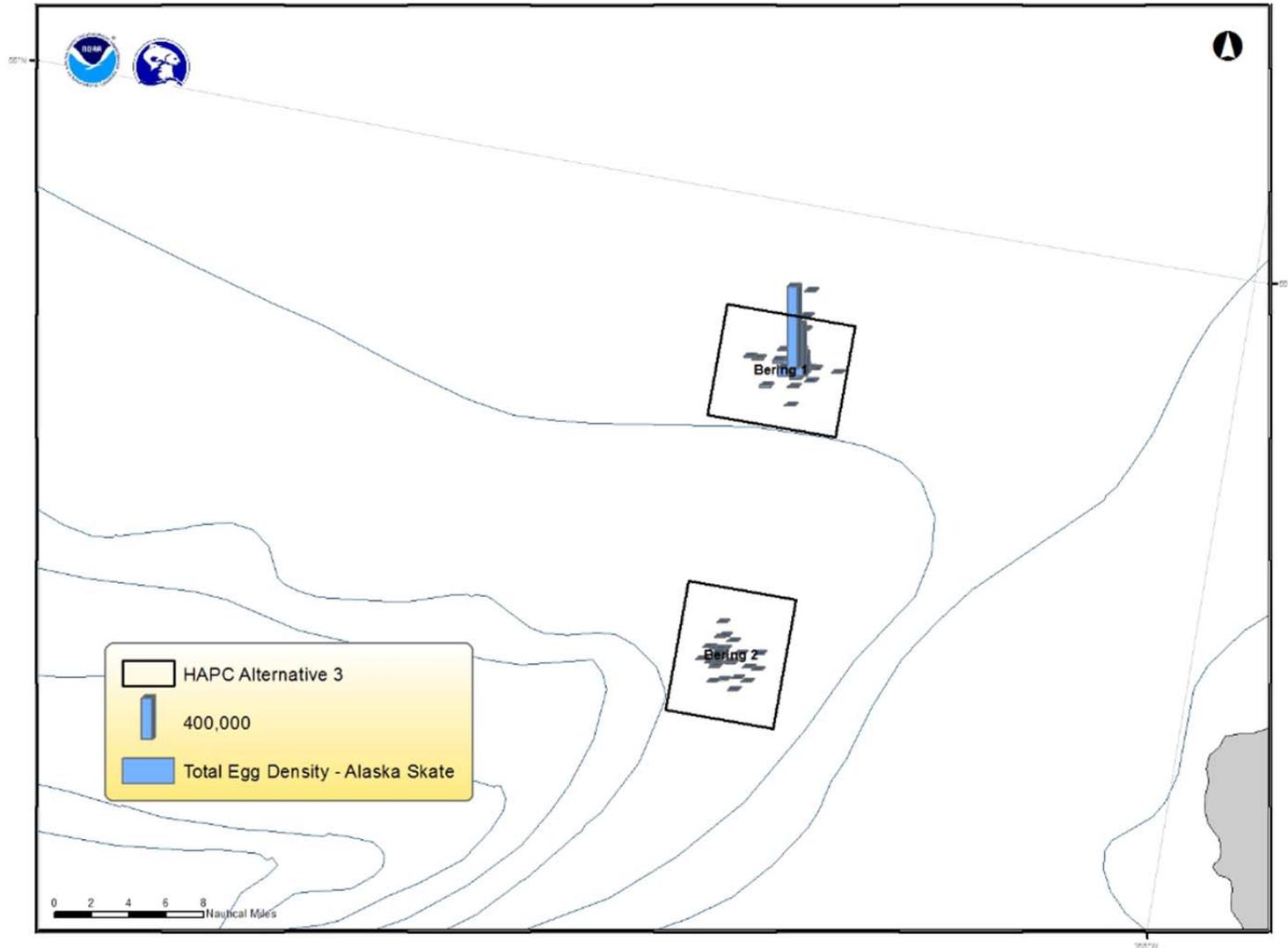
**Figure 6. Pribilof site under Alternative 2 (1.2 nm<sup>2</sup>, red boundary) and Alternative 3 (28nm<sup>2</sup>, black boundary).**  
**Source: NMFS HCD.**



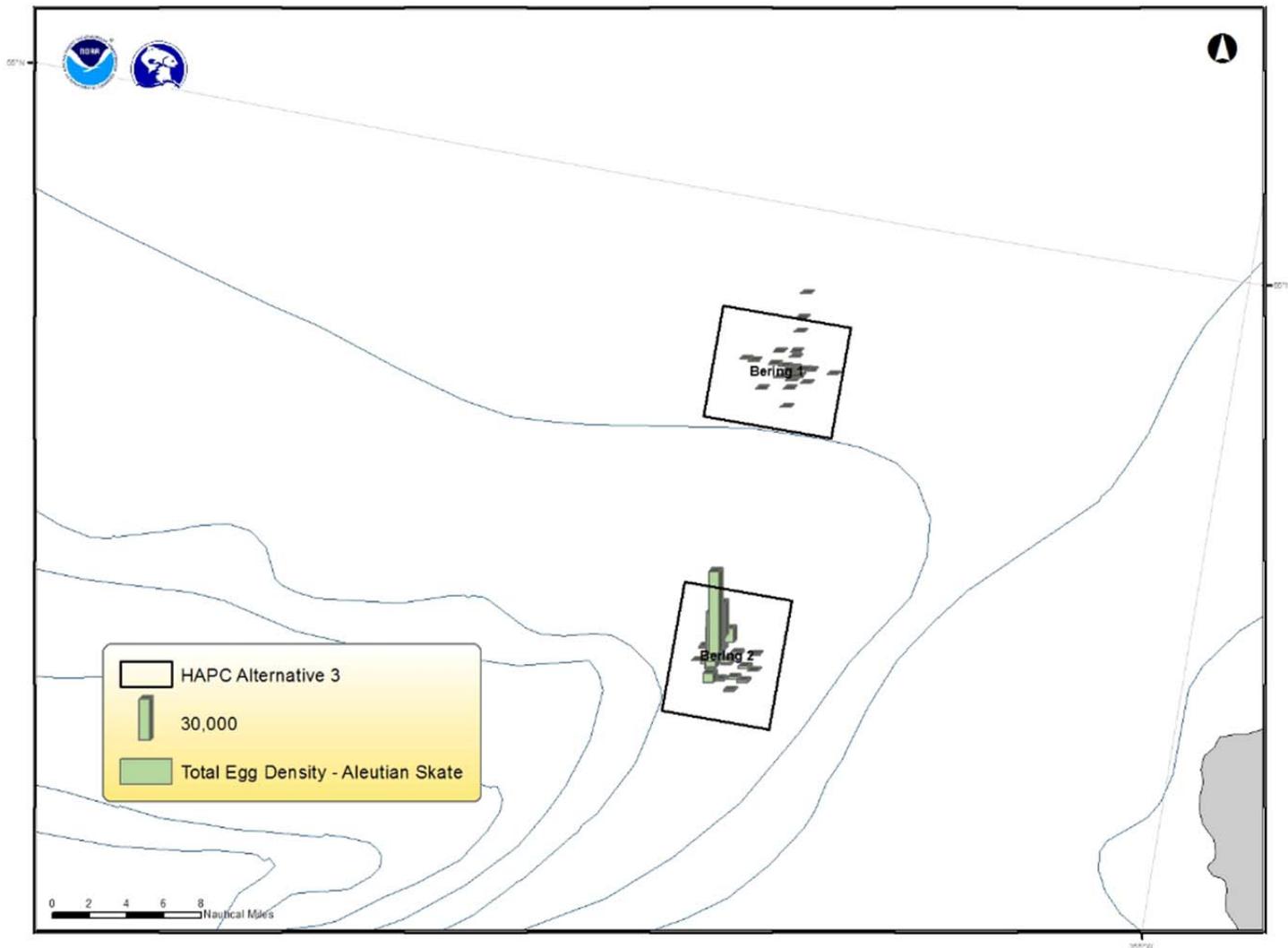
**Figure 7. Zhemchug site under Alternative 2 (3.2 nm<sup>2</sup>, red boundary) and Alternative 3 (27.4 nm<sup>2</sup>, black boundary).**  
 Source: NMFS HCD.



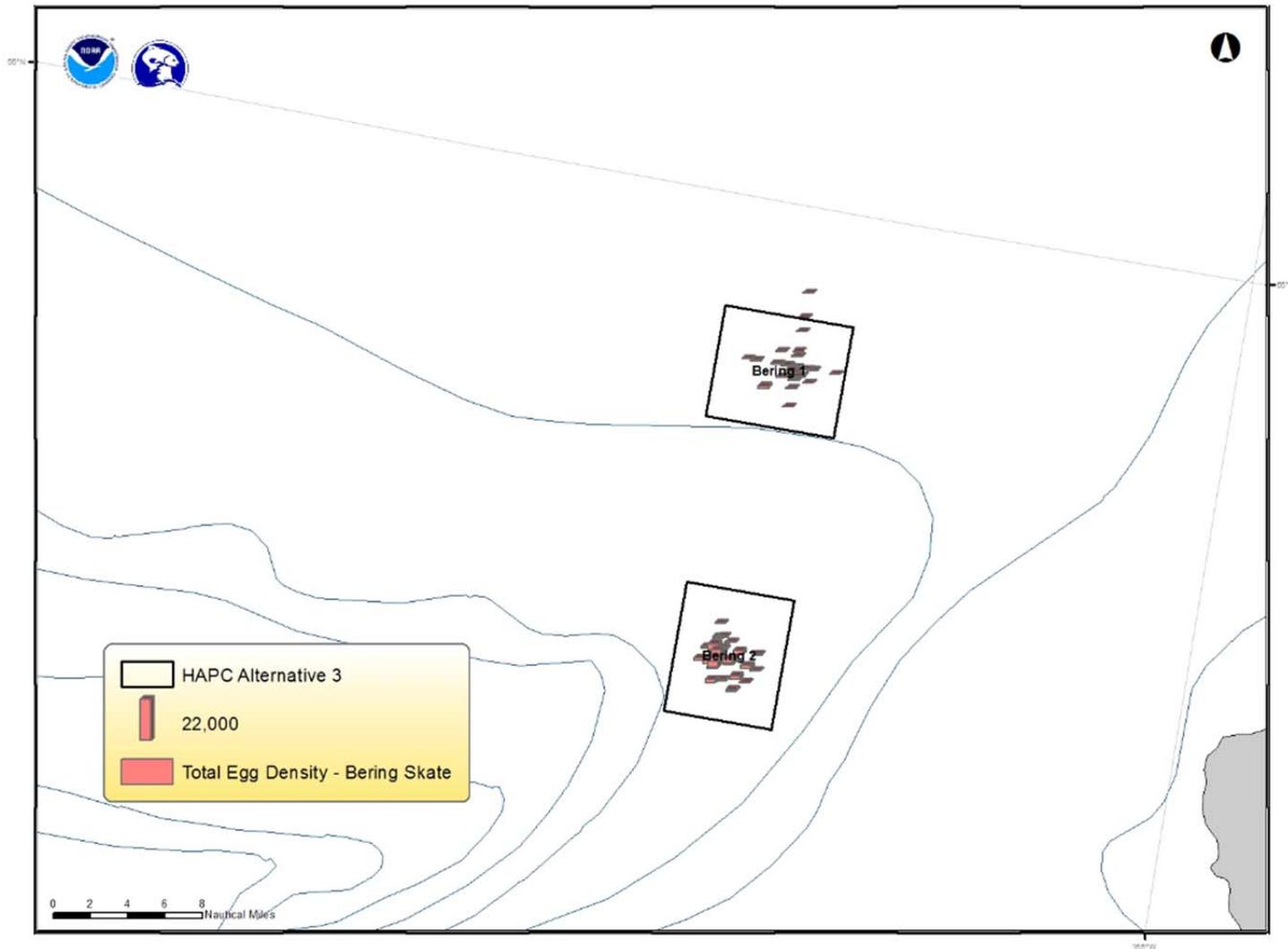
**Figure 8. Pervenets site under Alternative 2 (27.7 nm<sup>2</sup>, red boundary) and Alternative 3 (53.3 nm<sup>2</sup>, black boundary).**  
 Source: NMFS HCD.



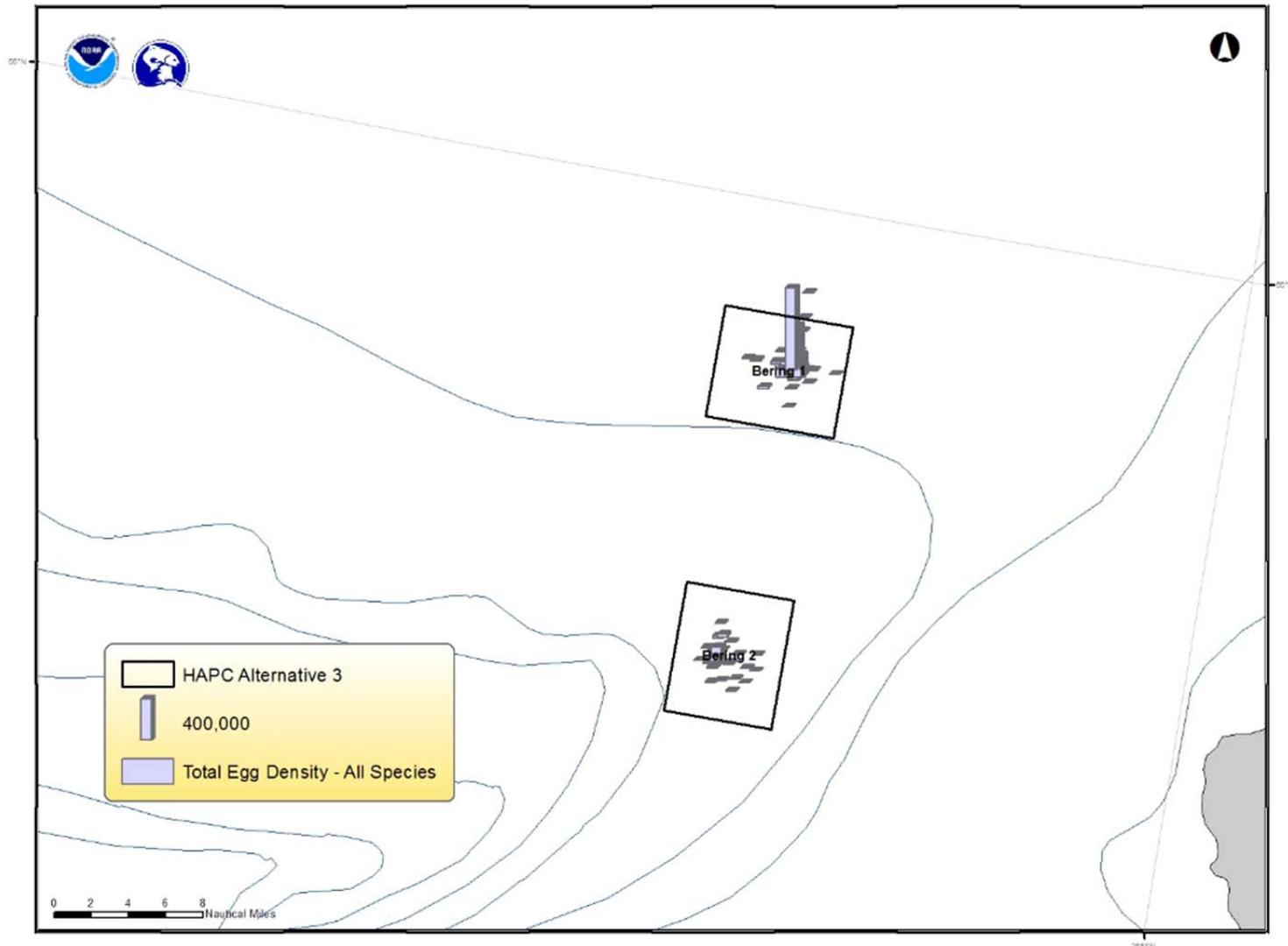
**Figure 9. Total Alaska skate egg density/km<sup>2</sup> in the Bering 1 and 2 sites under Alternative 3.**  
 Source: NMFS HCD and AFSC.



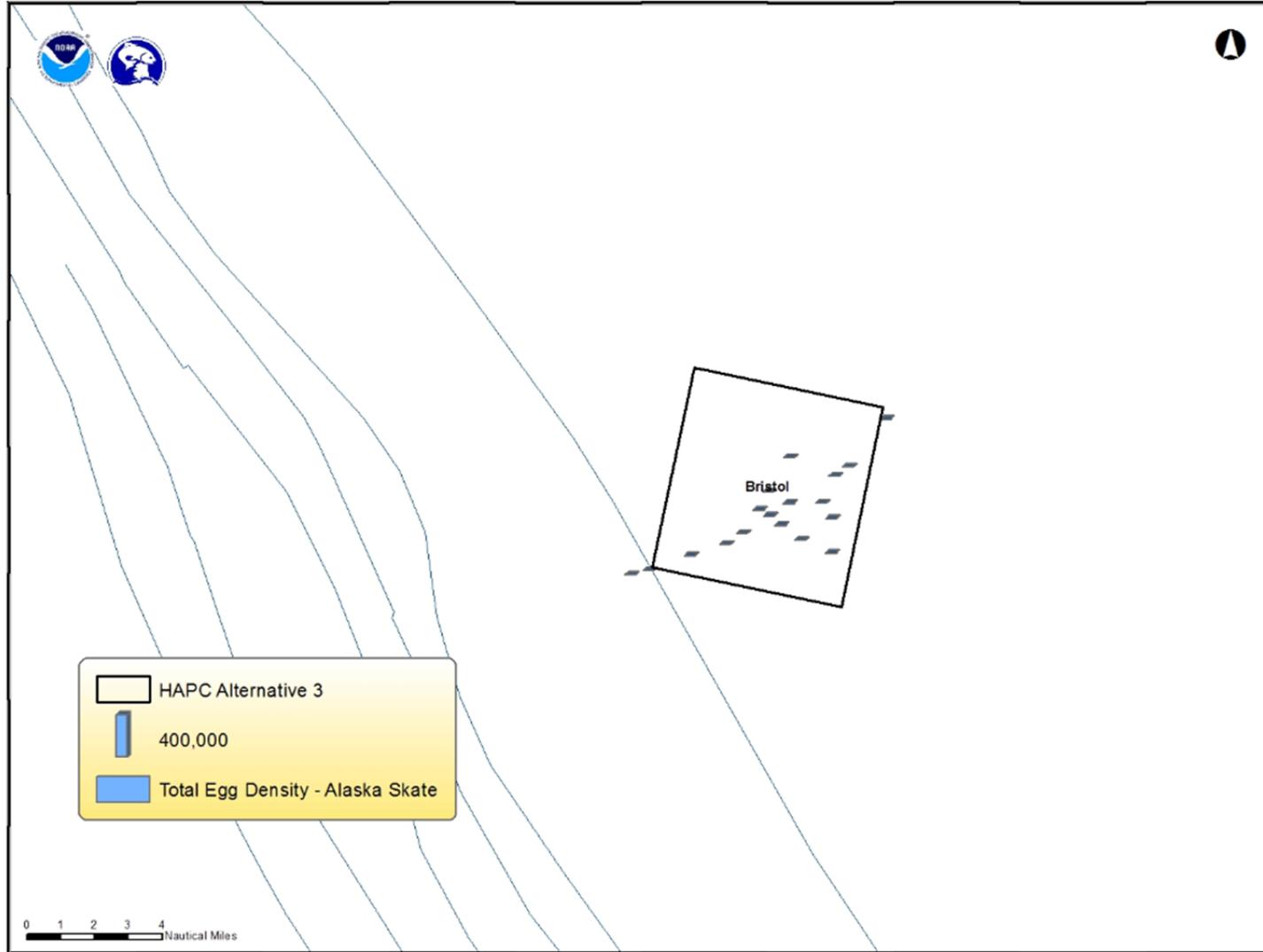
**Figure 10. Total Aleutian skate egg density/km<sup>2</sup> in the Bering 1 and 2 sites under Alternative 3.**  
 Source: NMFS HCD and AFSC.



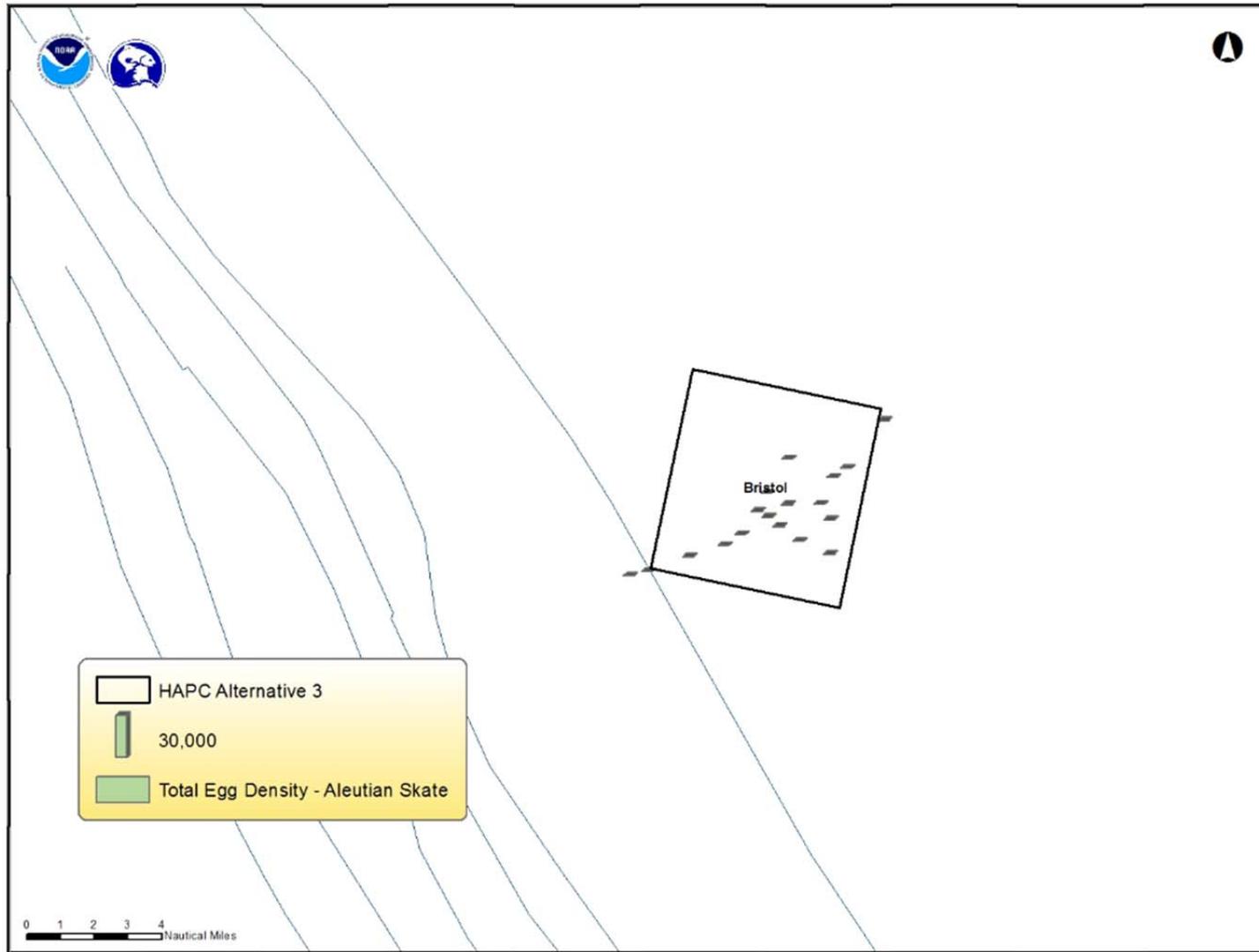
**Figure 11. Total Bering skate egg density/km<sup>2</sup> in the Bering 1 and 2 sites under Alternative 3.**  
**Source: NMFS HCD and AFSC.**



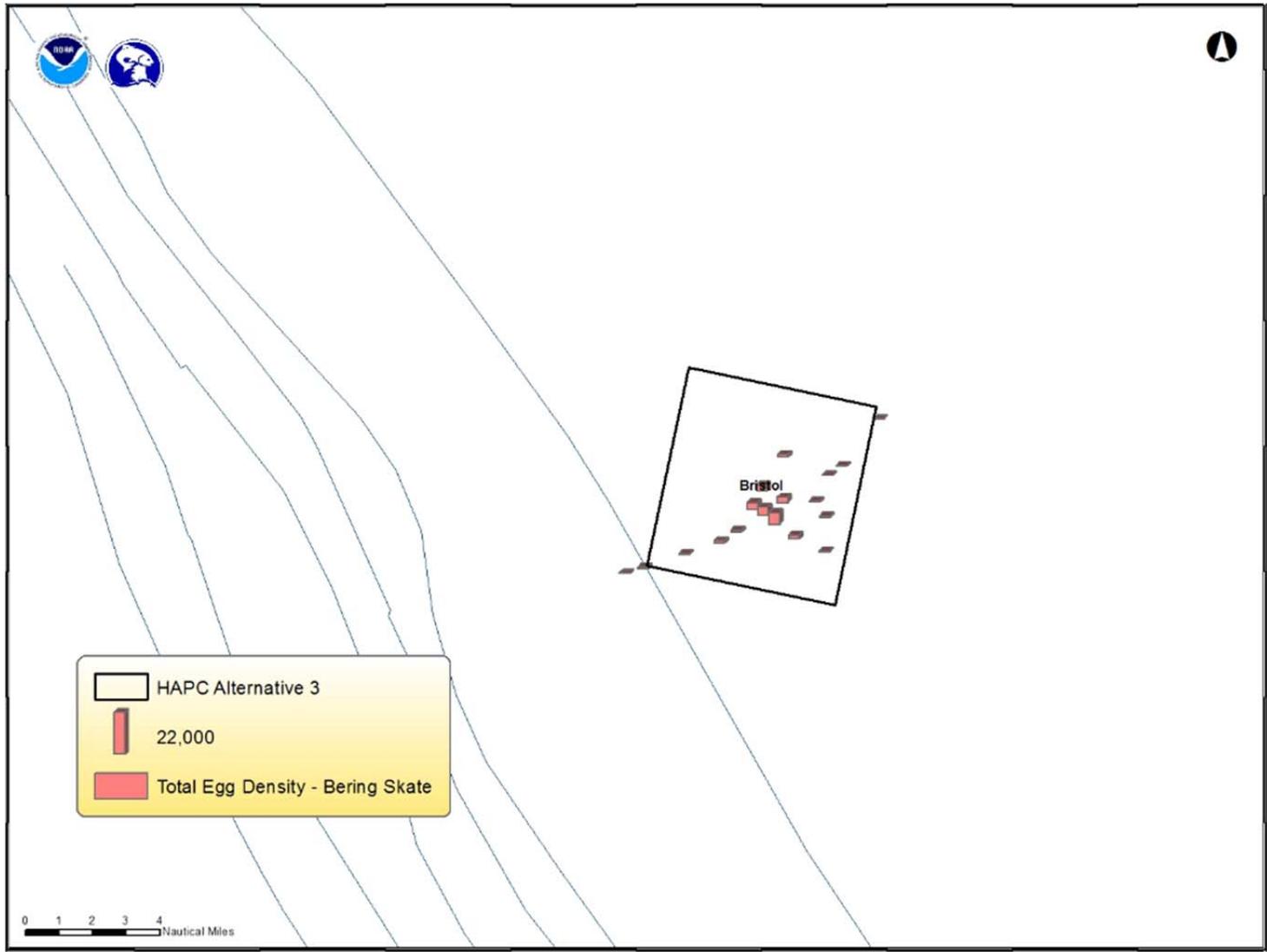
**Figure 12. Total skate egg density/km<sup>2</sup>, for all skate species, in the Bering 1 and 2 sites under Alternative 3.**  
**Source: NMFS HCD and AFSC.**



**Figure 13. Total Alaska skate egg density/km<sup>2</sup> in the Bristol site under Alternative 3.**  
**Source: NMFS HCD and AFSC.**



**Figure 14. Total Aleutian skate egg density/ $\text{km}^2$  in the Bristol site under Alternative 3.**  
**Source: NMFS HCD and AFSC.**



**Figure 15. Total Bering skate egg density/km<sup>2</sup> in the Bristol site under Alternative 3.**  
Source: NMFS HCD and AFSC.

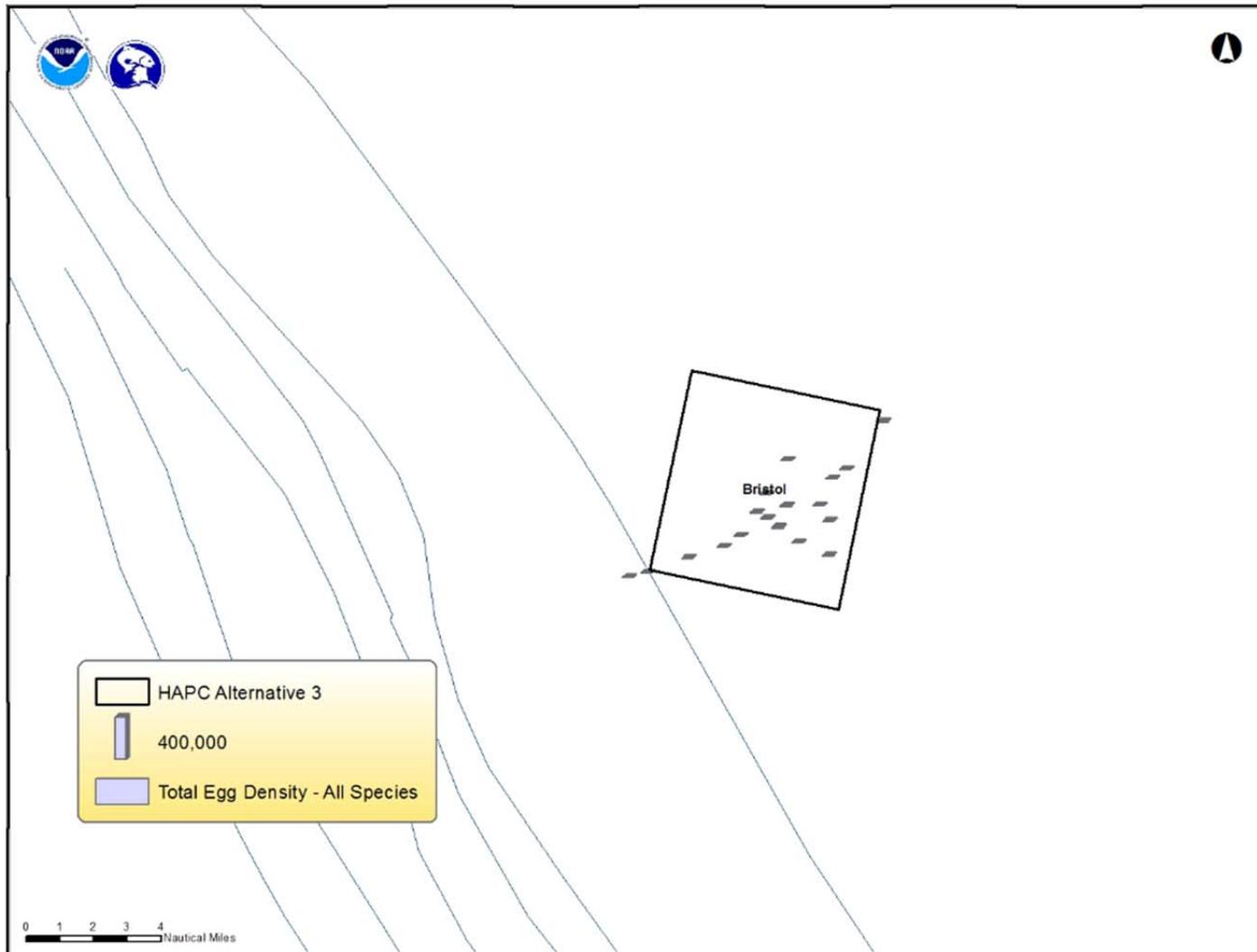
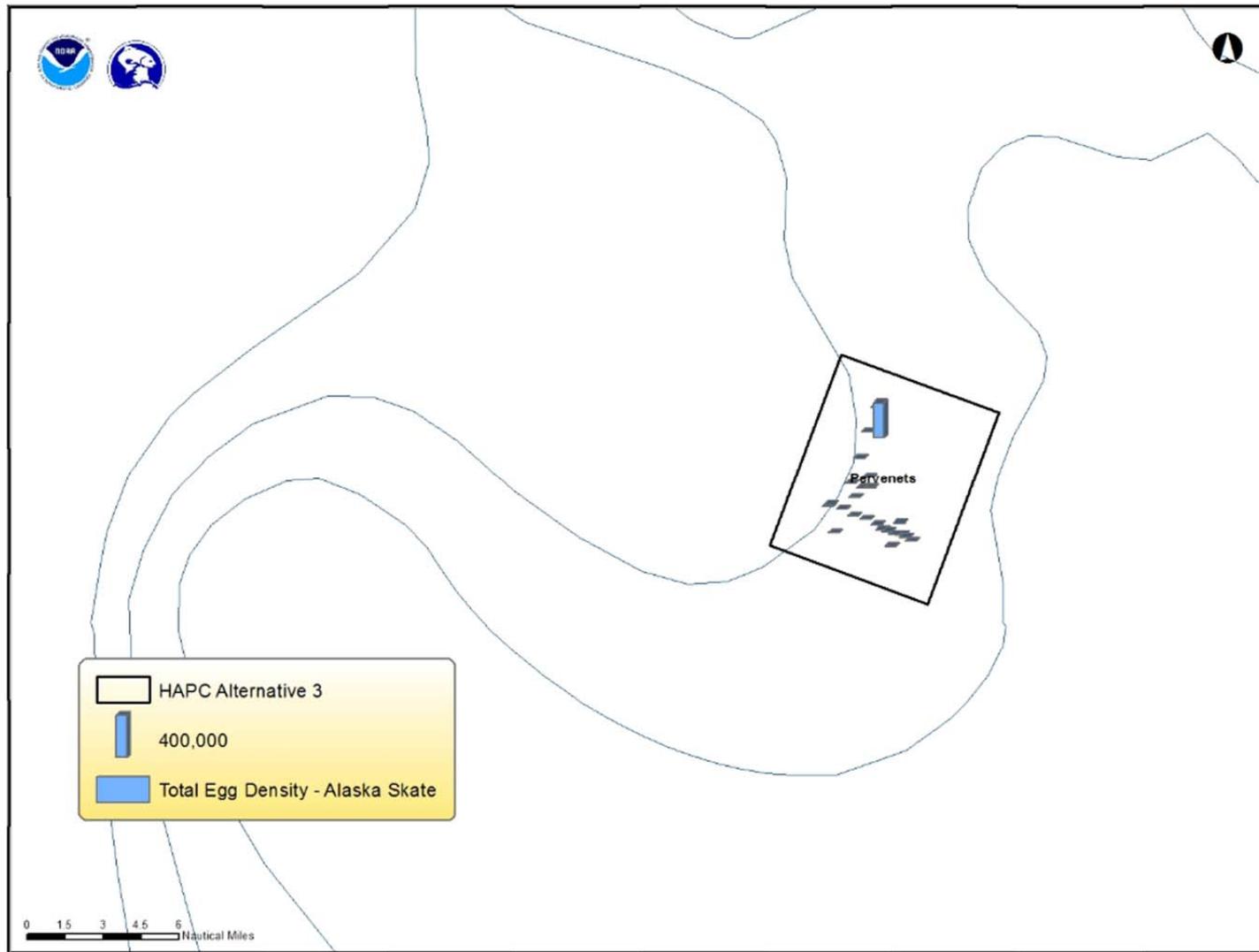
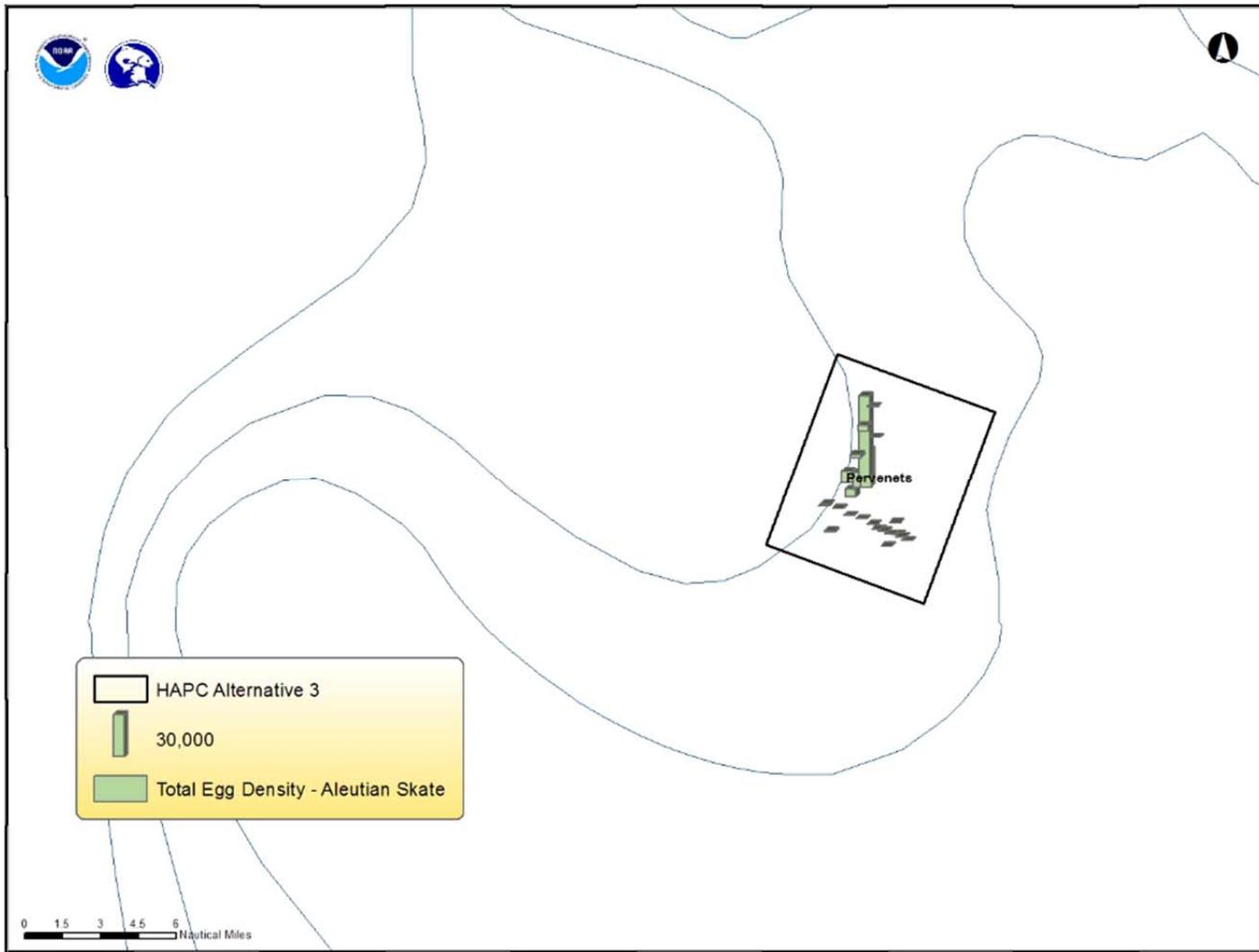


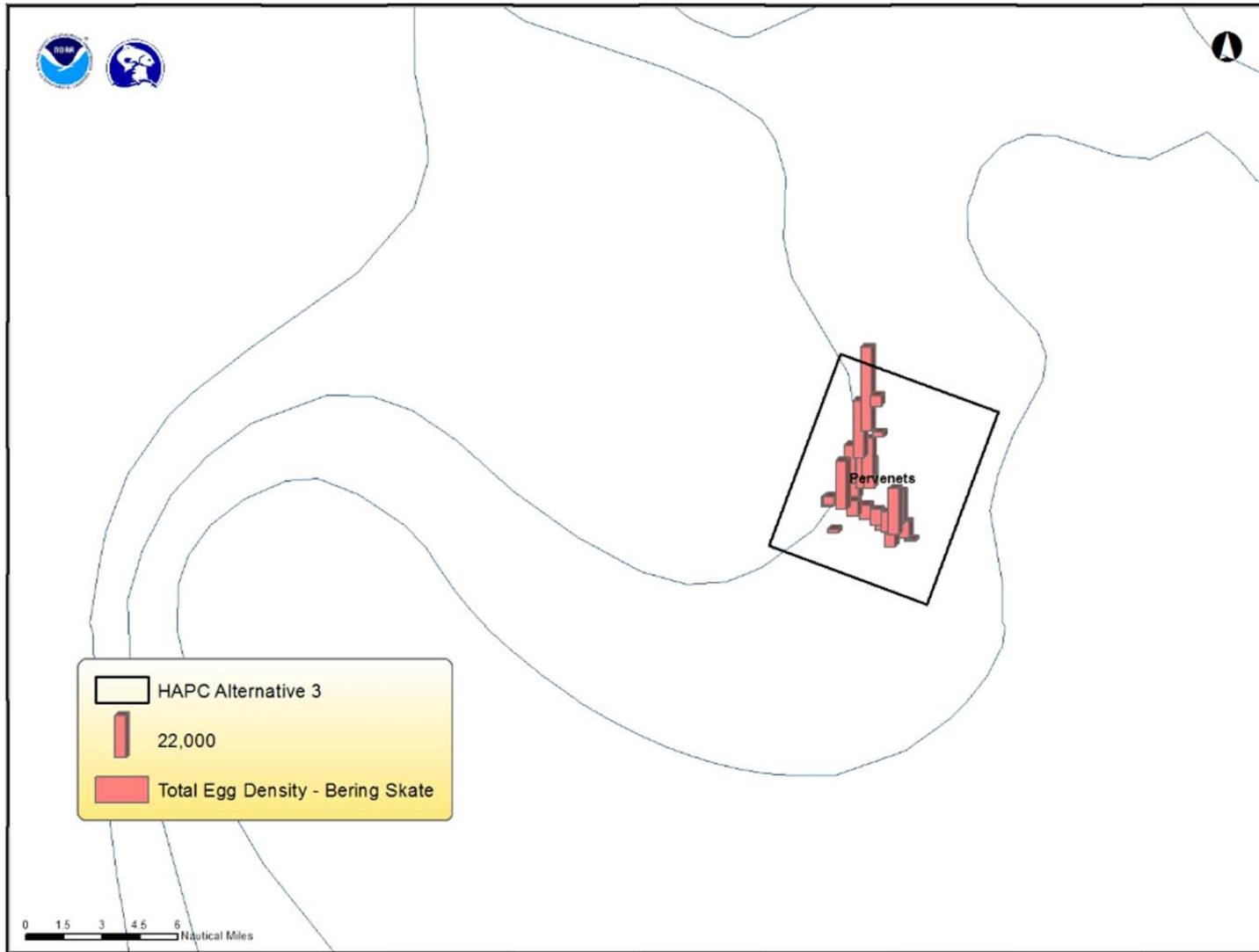
Figure 16. Total skate egg density/ $\text{km}^2$ , for all skate species, in the Bristol site under Alternative 3.  
Source: NMFS HCD and AFSC.



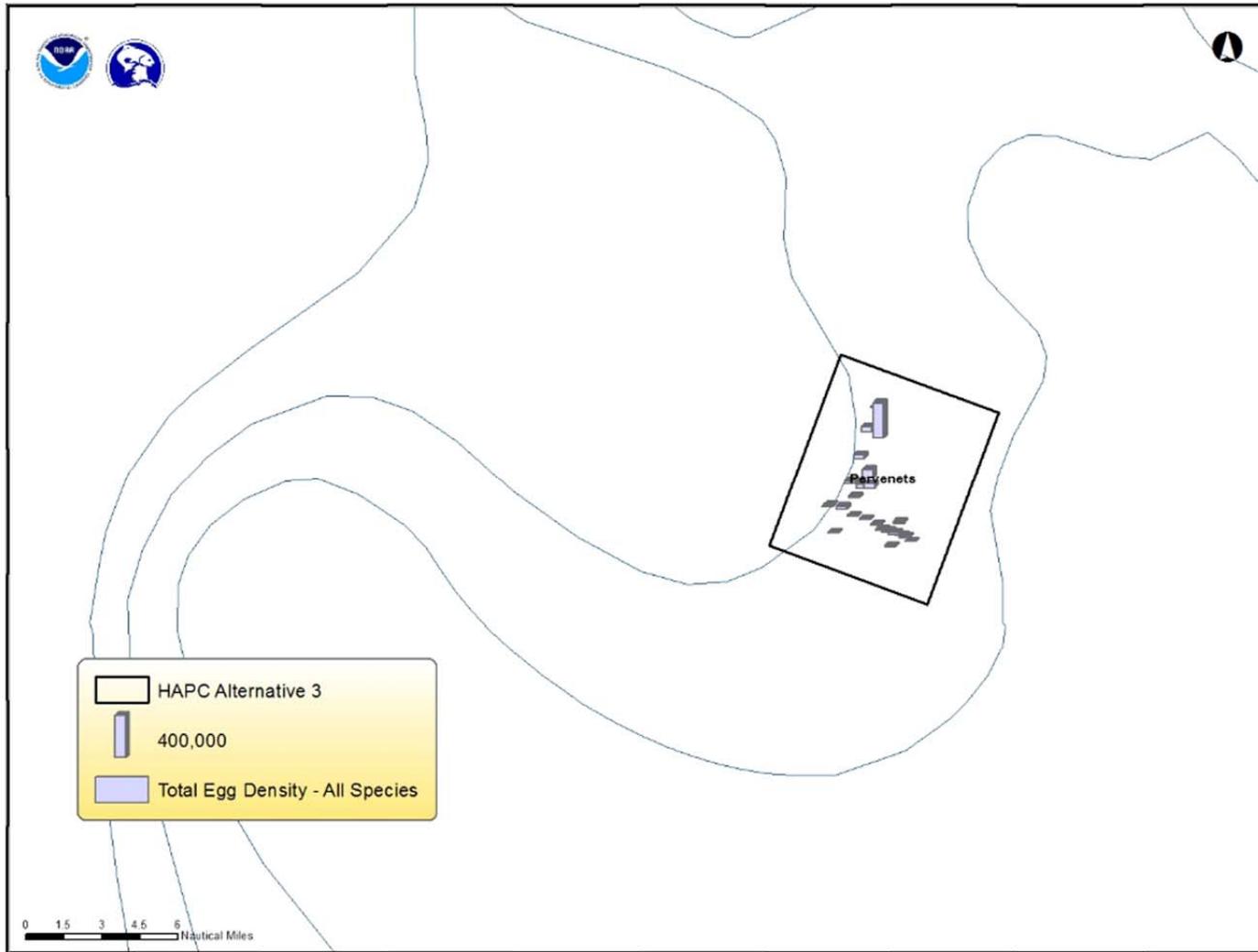
**Figure 17. Total Alaska skate egg density/km<sup>2</sup> in the Pervenets site under Alternative 3.**  
**Source: NMFS HCD and AFSC.**



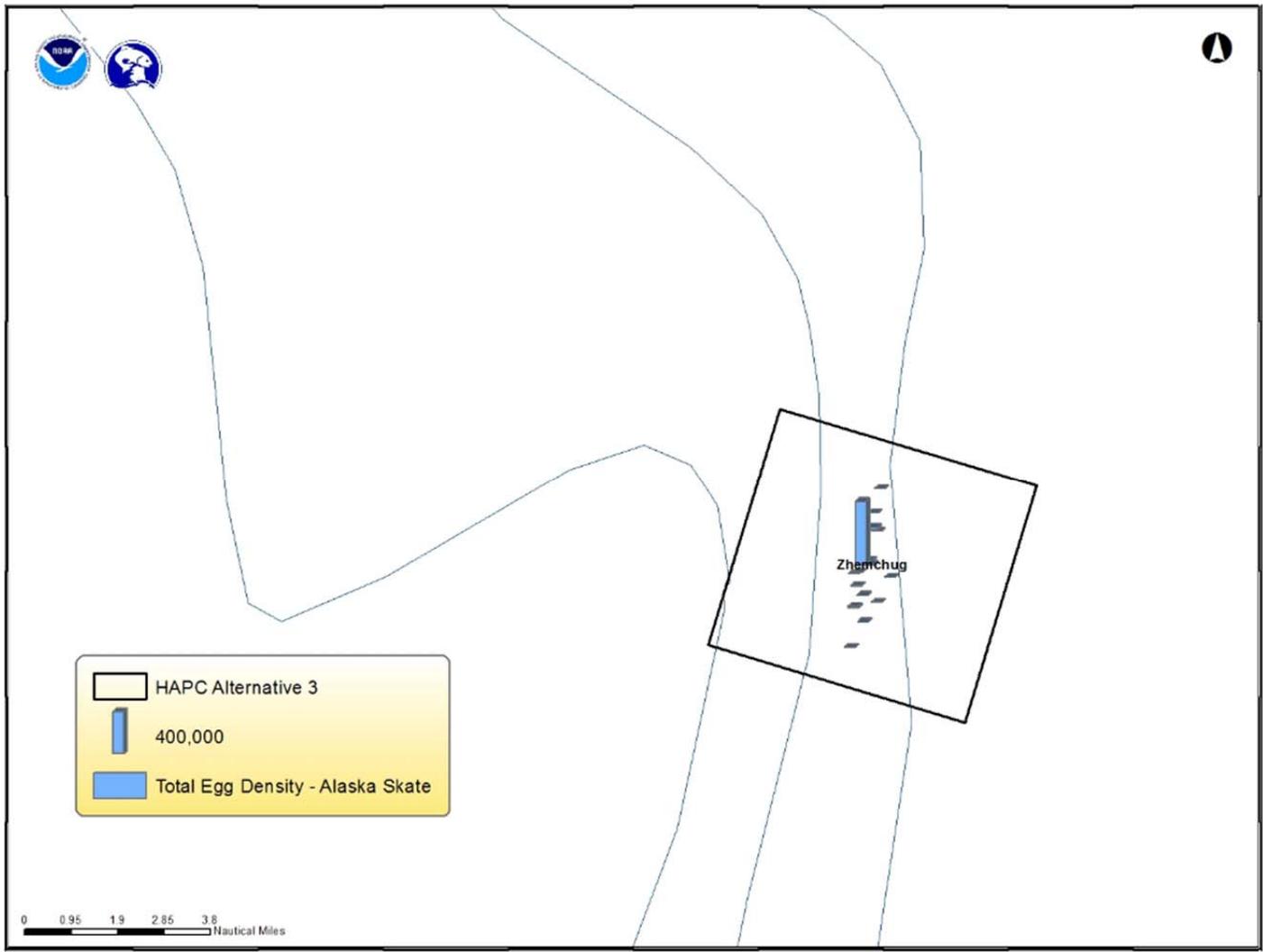
**Figure 18. Total Aleutian skate egg density/km<sup>2</sup> in the Pervenets site under Alternative 3.**  
**Source: NMFS HCD and AFSC.**



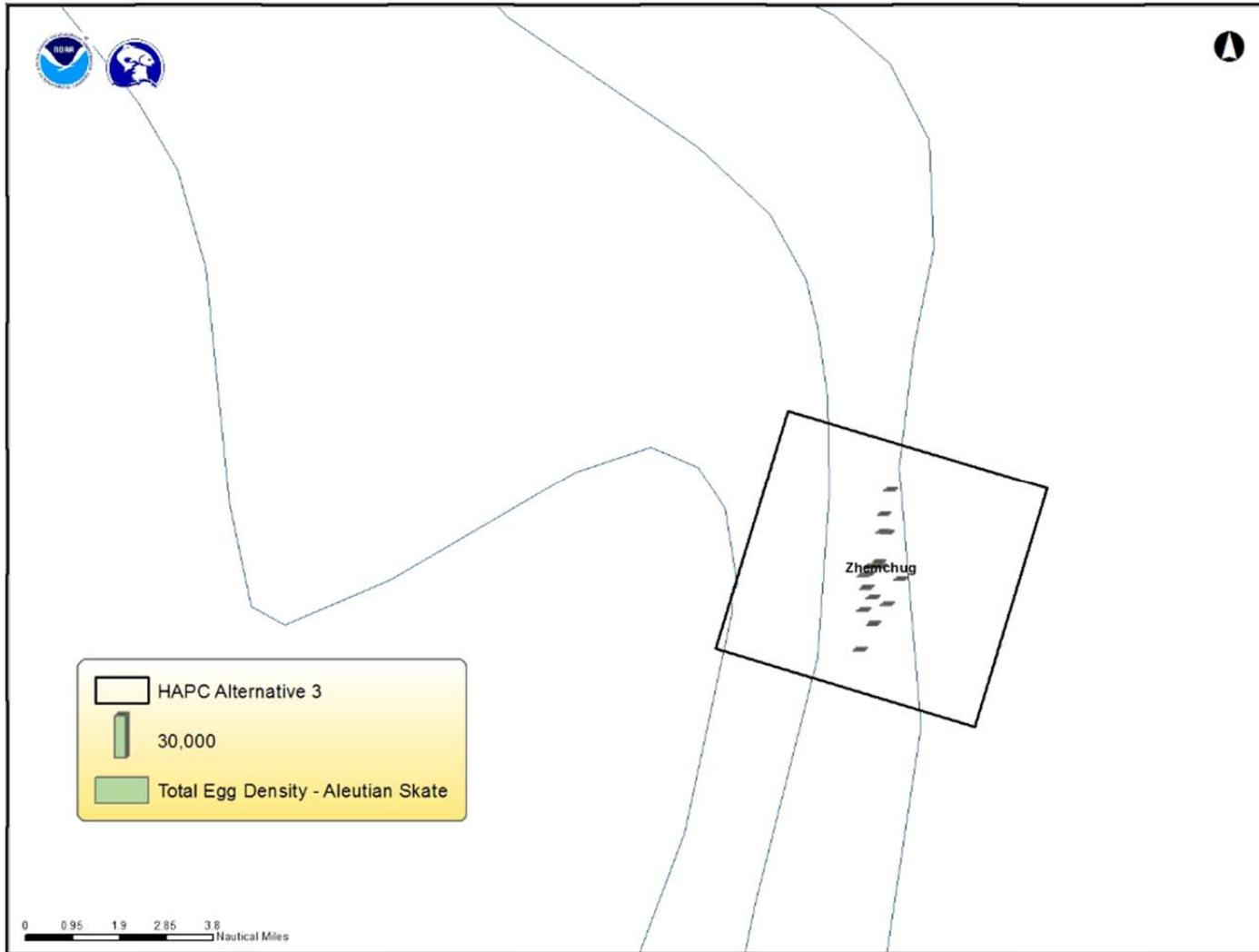
**Figure 19. Total Bering skate egg density/km<sup>2</sup> in the Pervenets site under Alternative 3.**  
**Source: NMFS HCD and AFSC.**



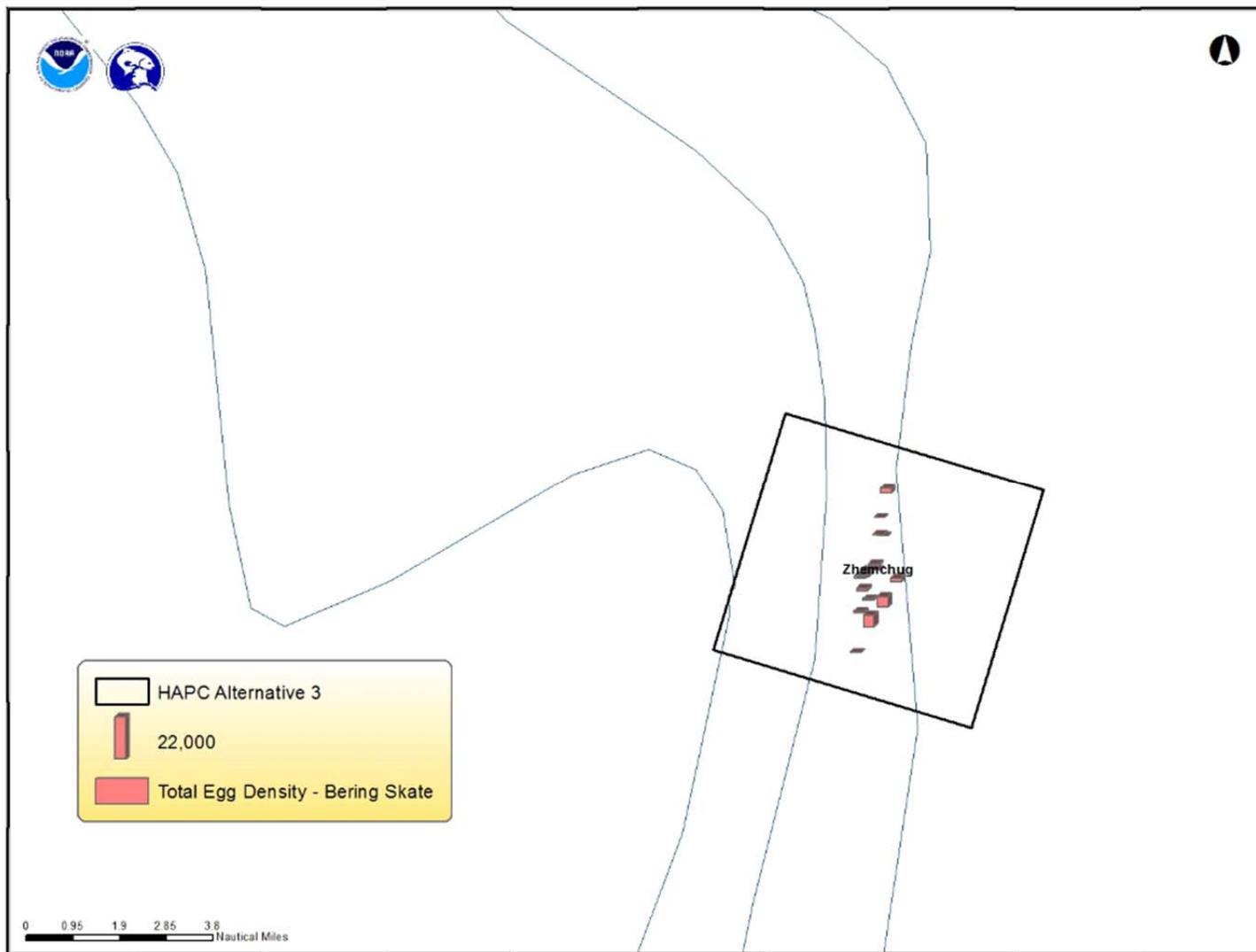
**Figure 20. Total skate egg density/km<sup>2</sup>, for all skate species, in the Pervenets site under Alternative 3.**  
**Source: NMFS HCD and AFSC.**



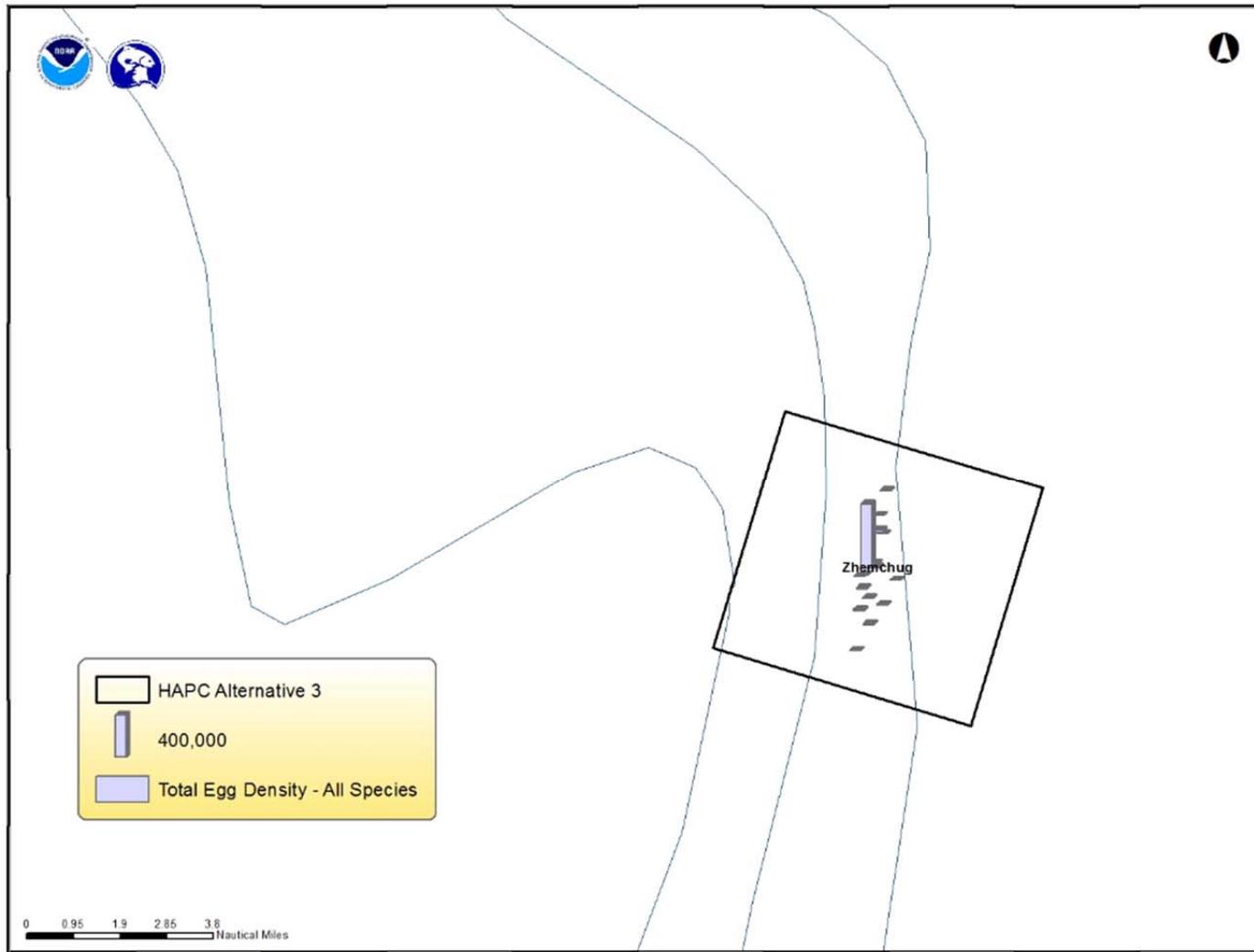
**Figure 21. Total Alaska skate egg density/km<sup>2</sup> in the Zhemchug site under Alternative 3.**  
**Source: NMFS HCD and AFSC.**



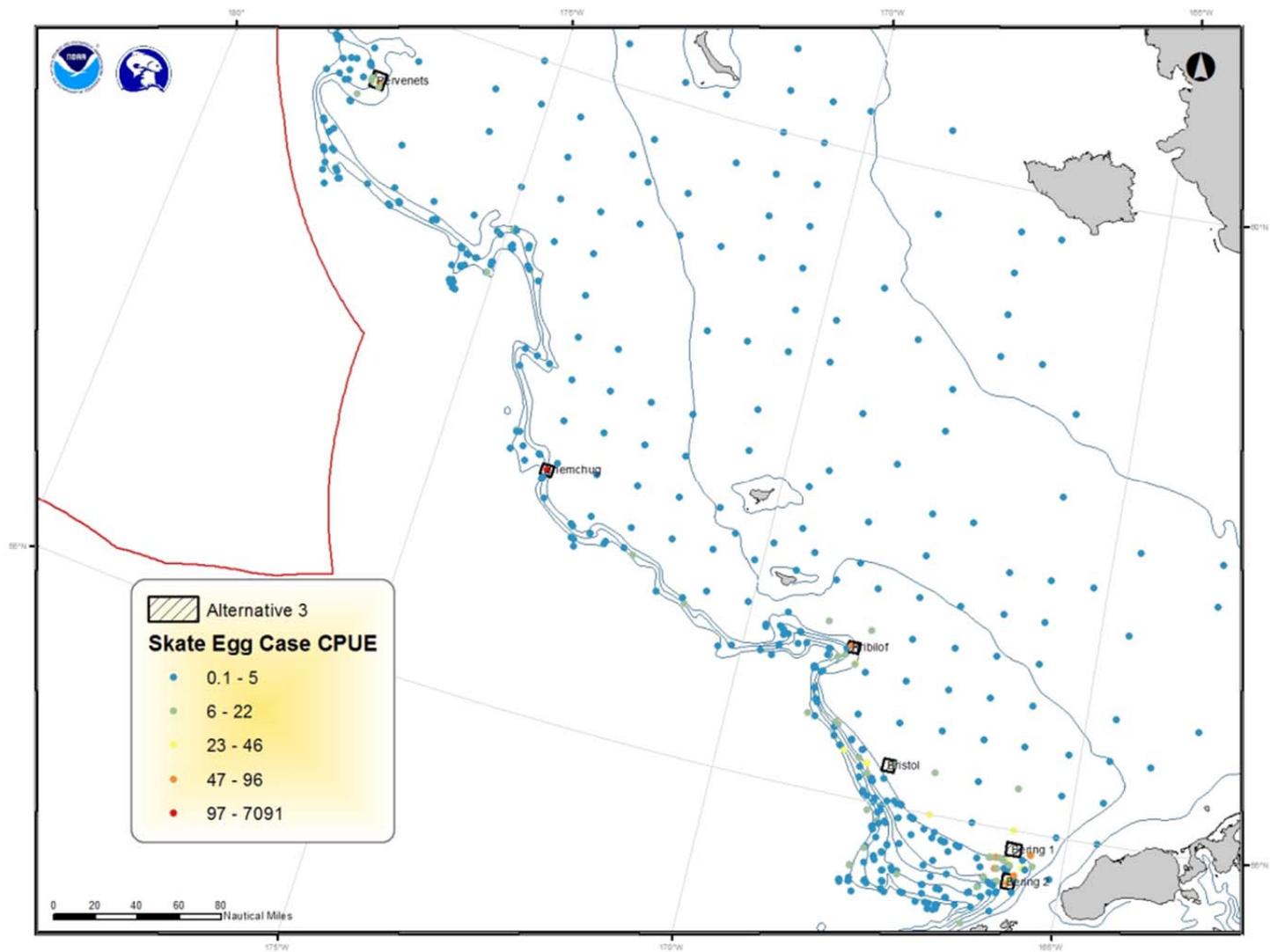
**Figure 22. Total Aleutian skate egg density/km<sup>2</sup> in the Zhemchug site under Alternative 3.**  
**Source: NMFS HCD and AFSC.**



**Figure 23. Total Bering skate egg density/km<sup>2</sup> in the Zhemchug site under Alternative 3.**  
**Source: NMFS HCD and AFSC.**

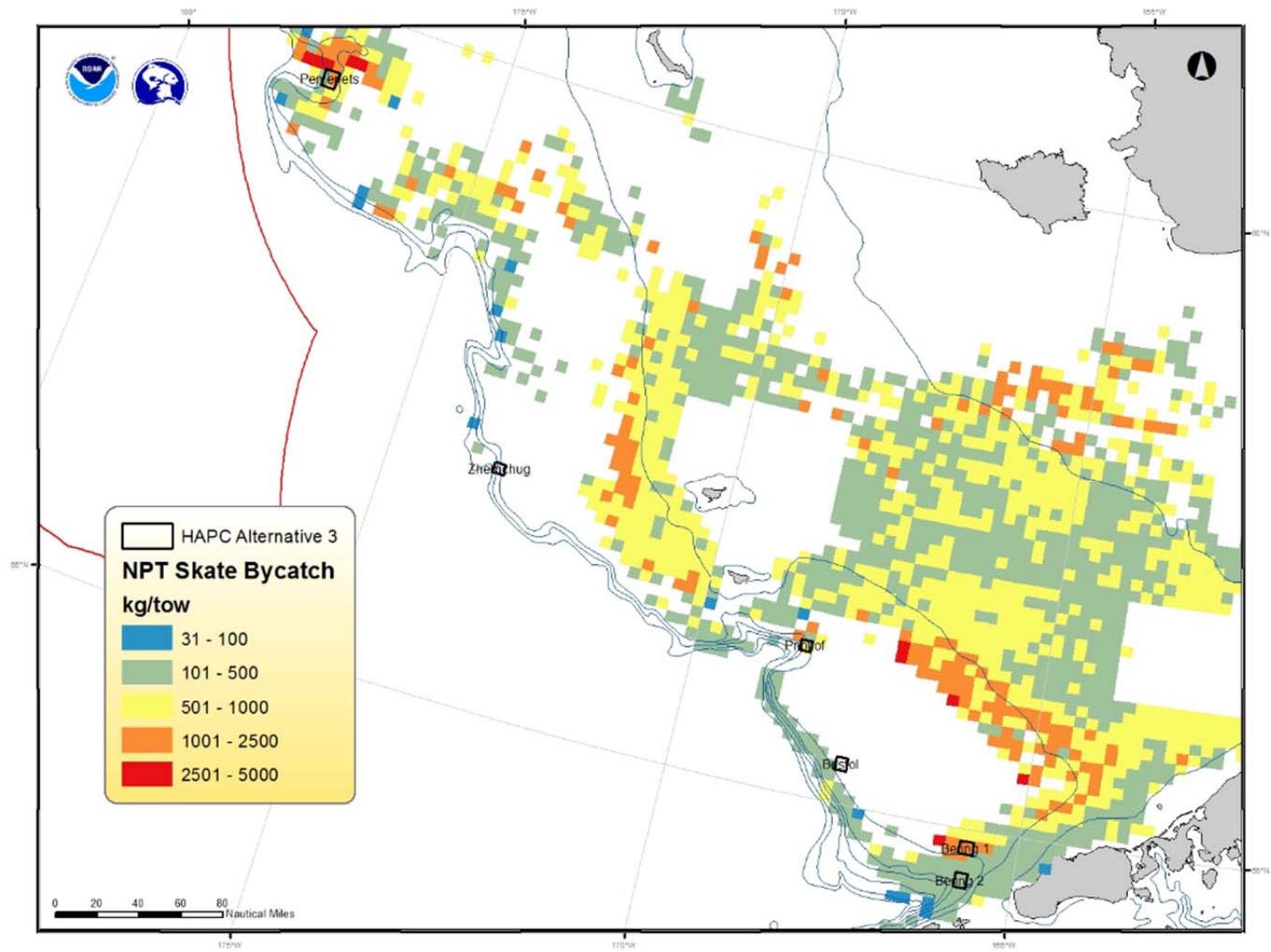


**Figure 24. Total skate egg density/ $\text{km}^2$ , for all skate species, in the Zhemchug site under Alternative 3.  
Source: NMFS HCD and AFSC.**

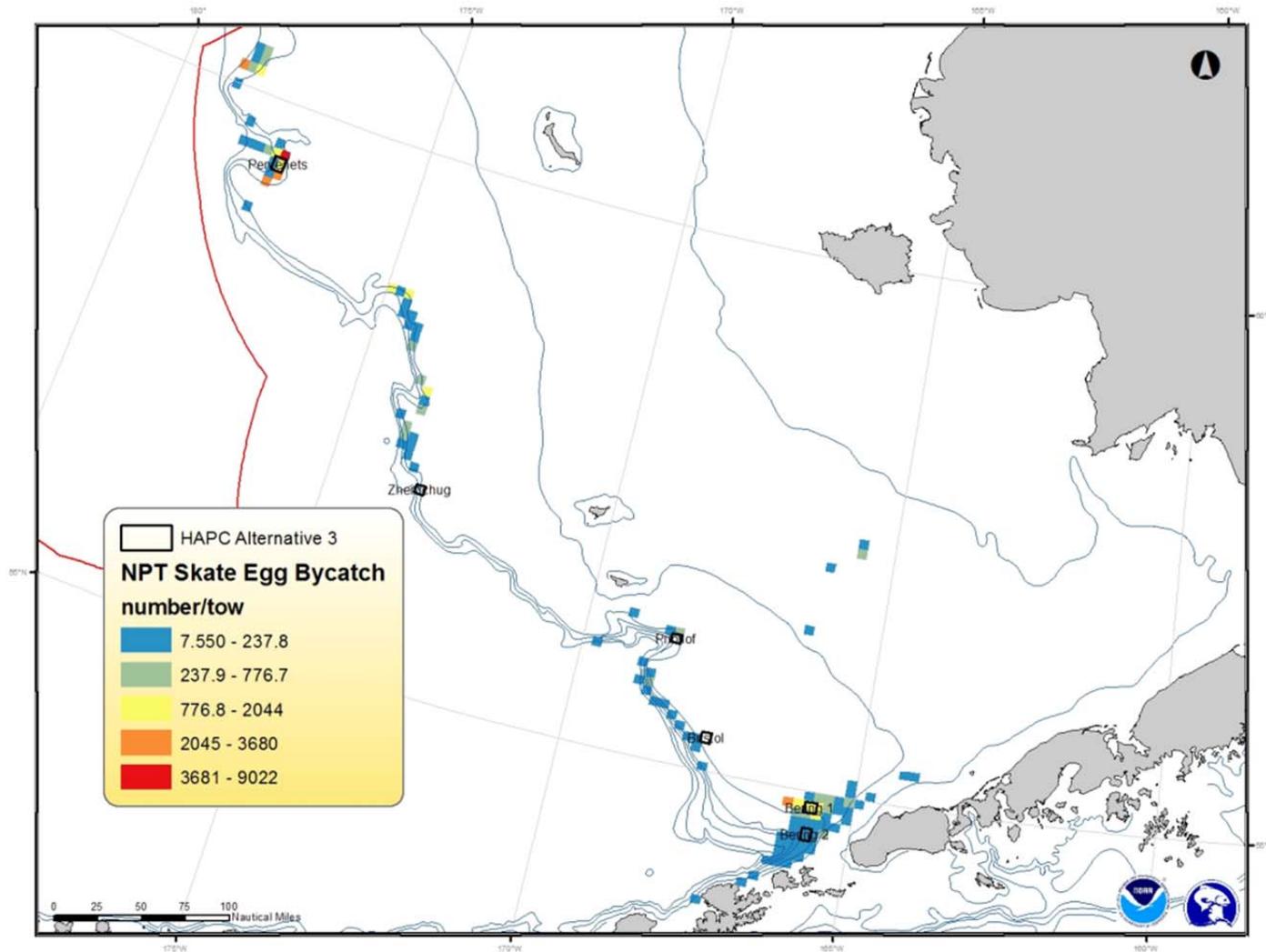


**Figure 25. Skate egg concentration areas with RACE survey CPUE of skate egg cases under Alternative 3.**  
**Source: NMFS HCD.**

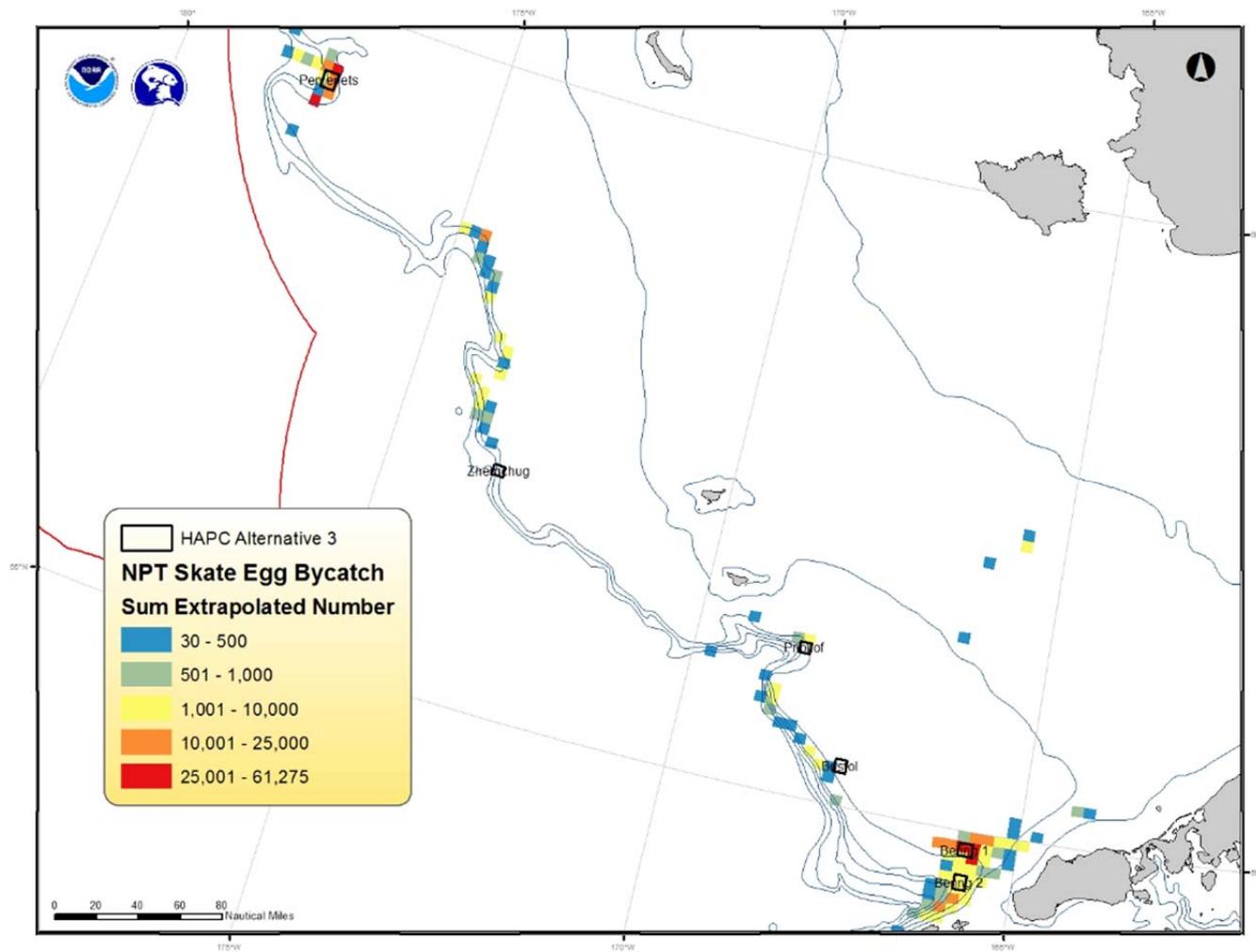




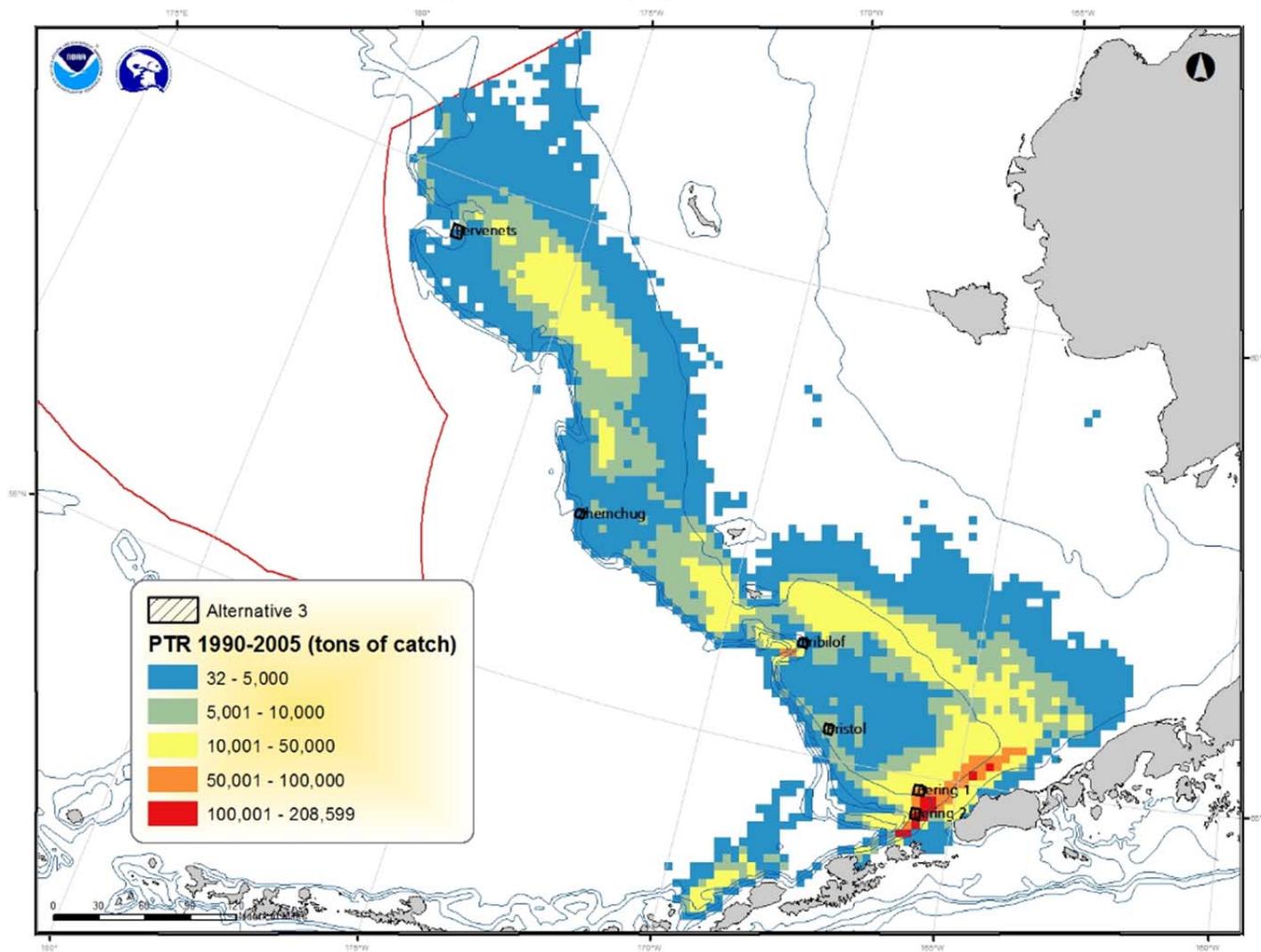
**Figure 27. Observed nonpelagic trawl (NPT) skate bycatch, CPUE from 2000 to 2011. (CPUE is based on tows with observed skate bycatch only.)**  
**Source: NMFS HCD.**



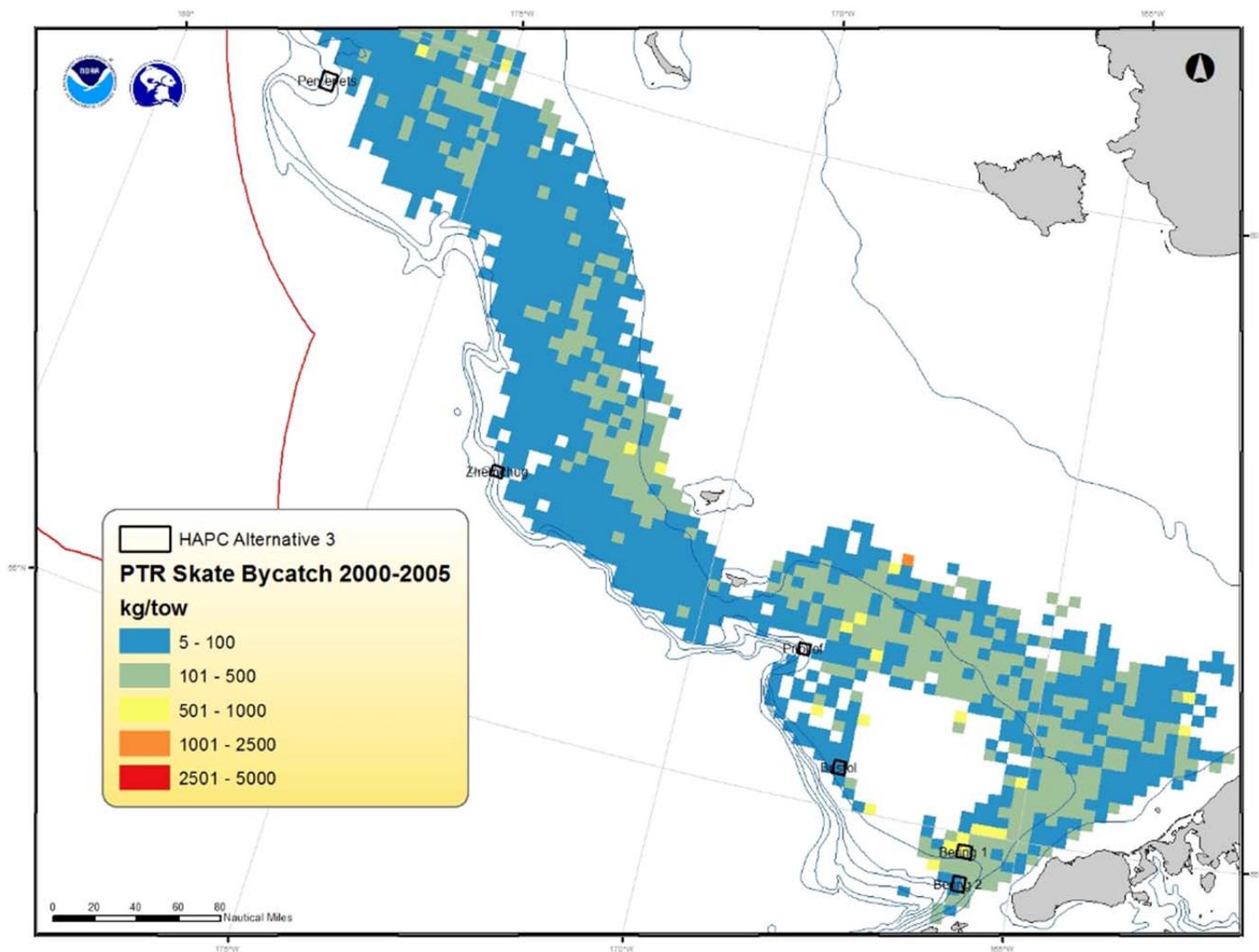
**Figure 28. Observed nonpelagic trawl (NPT) skate egg bycatch, CPUE from 2000 to 2011. (CPUE is based in tows with observed skate egg bycatch only). Source: NMFS HCD.**



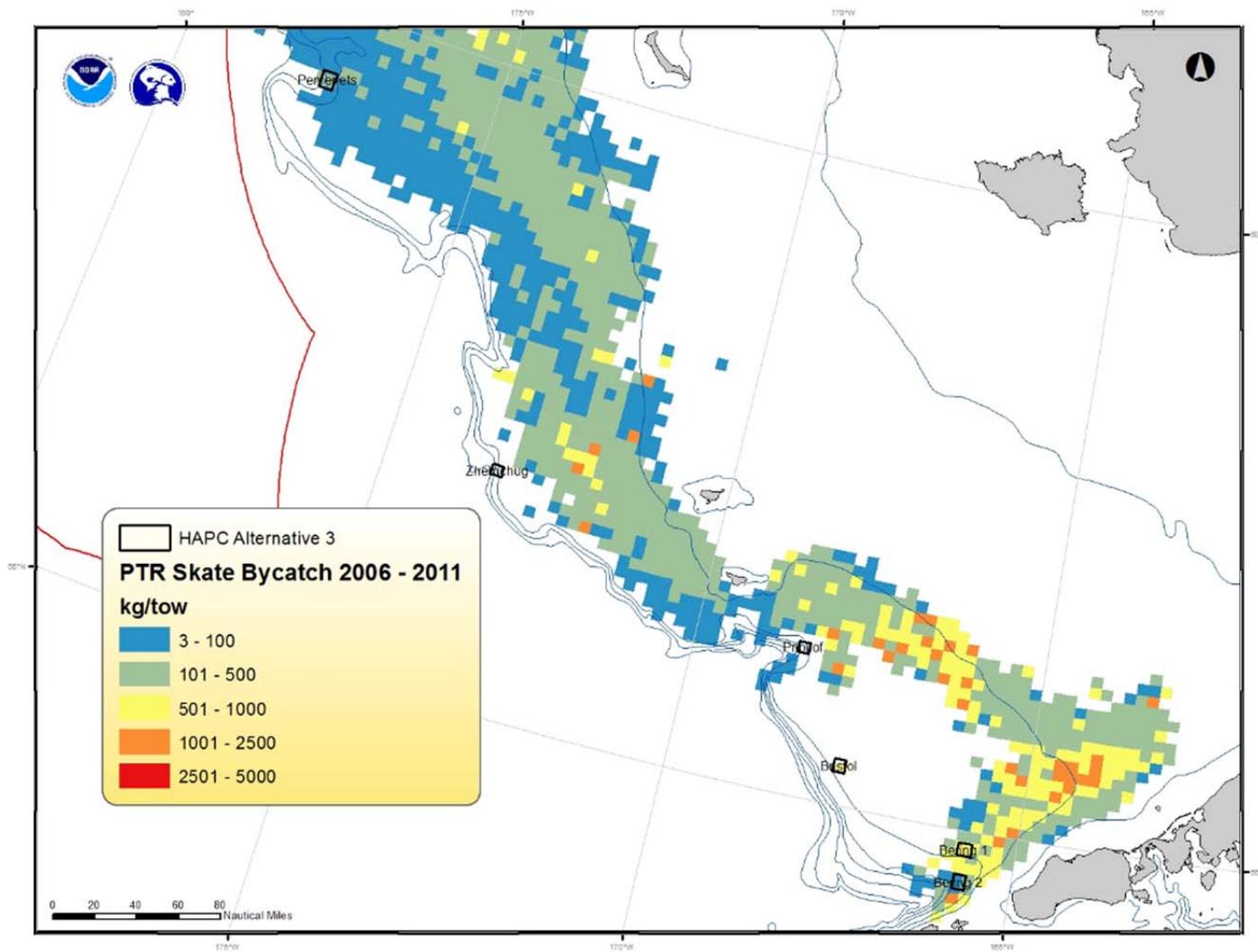
**Figure 29. Observed nonpelagic trawl (NPT) skate egg bycatch, from 1998 to 2011, in extrapolated numbers.**  
**Source: NMFS HCD.**



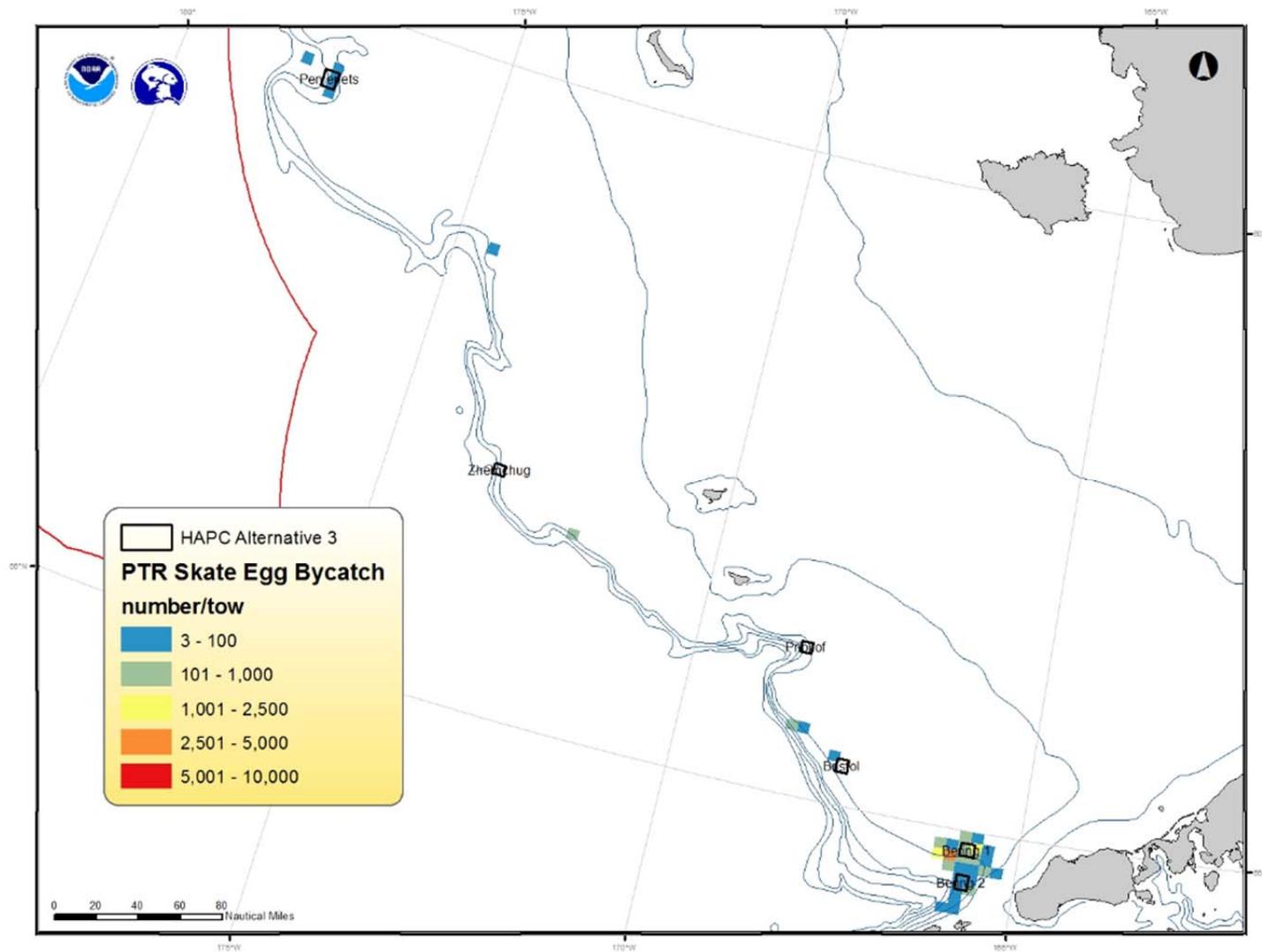
**Figure 30. Skate egg concentration areas with observed pelagic trawl (PTR), in tons of catch, from 1990 to 2005 under Alternative 3.**  
**Source: NMFS HCD.**



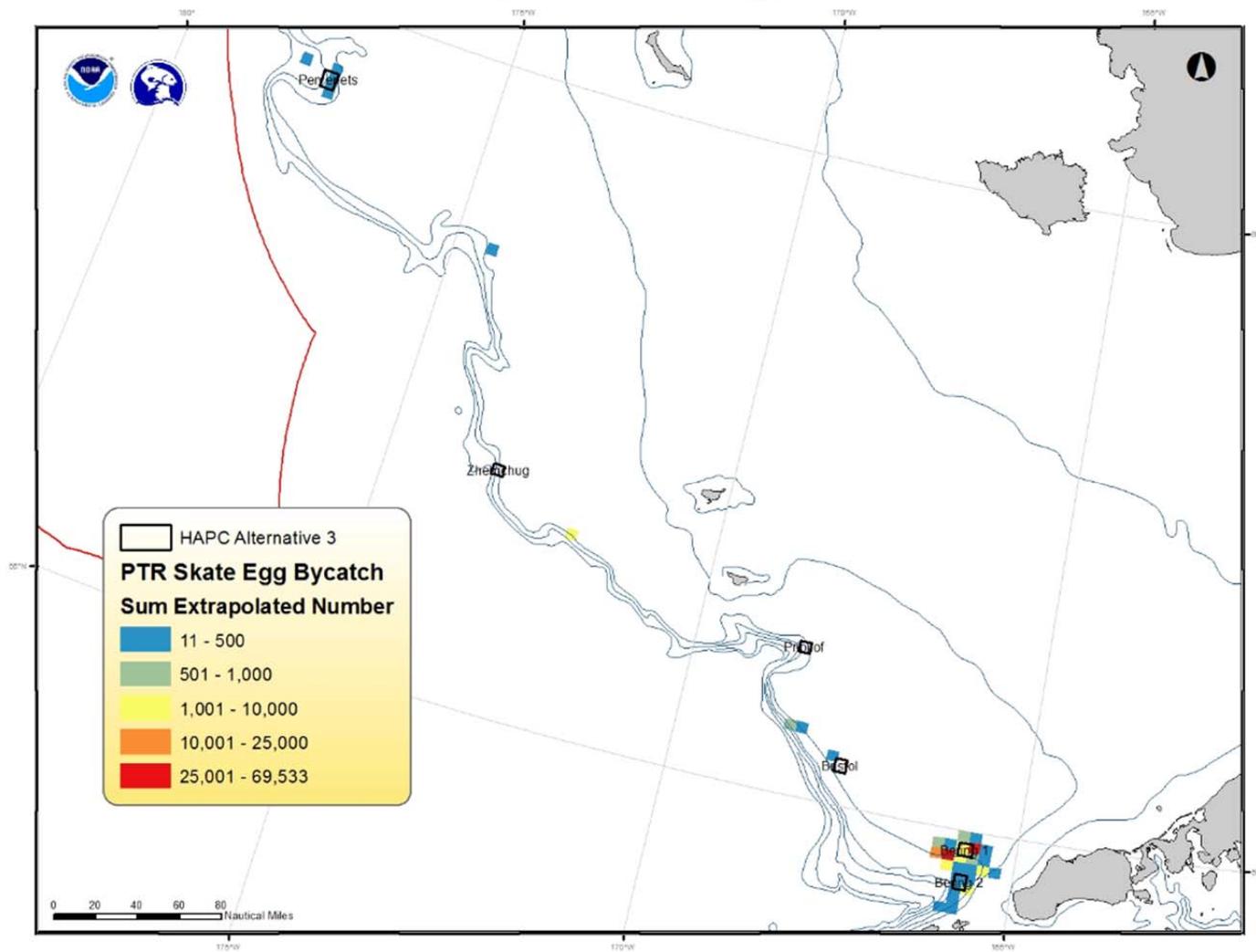
**Figure 31. Observed pelagic trawl (PTR) skate bycatch, CPUE from 2000 to 2005.**  
 (CPUE based on tows with observed skate bycatch only.)  
 Source: NMFS HCD.



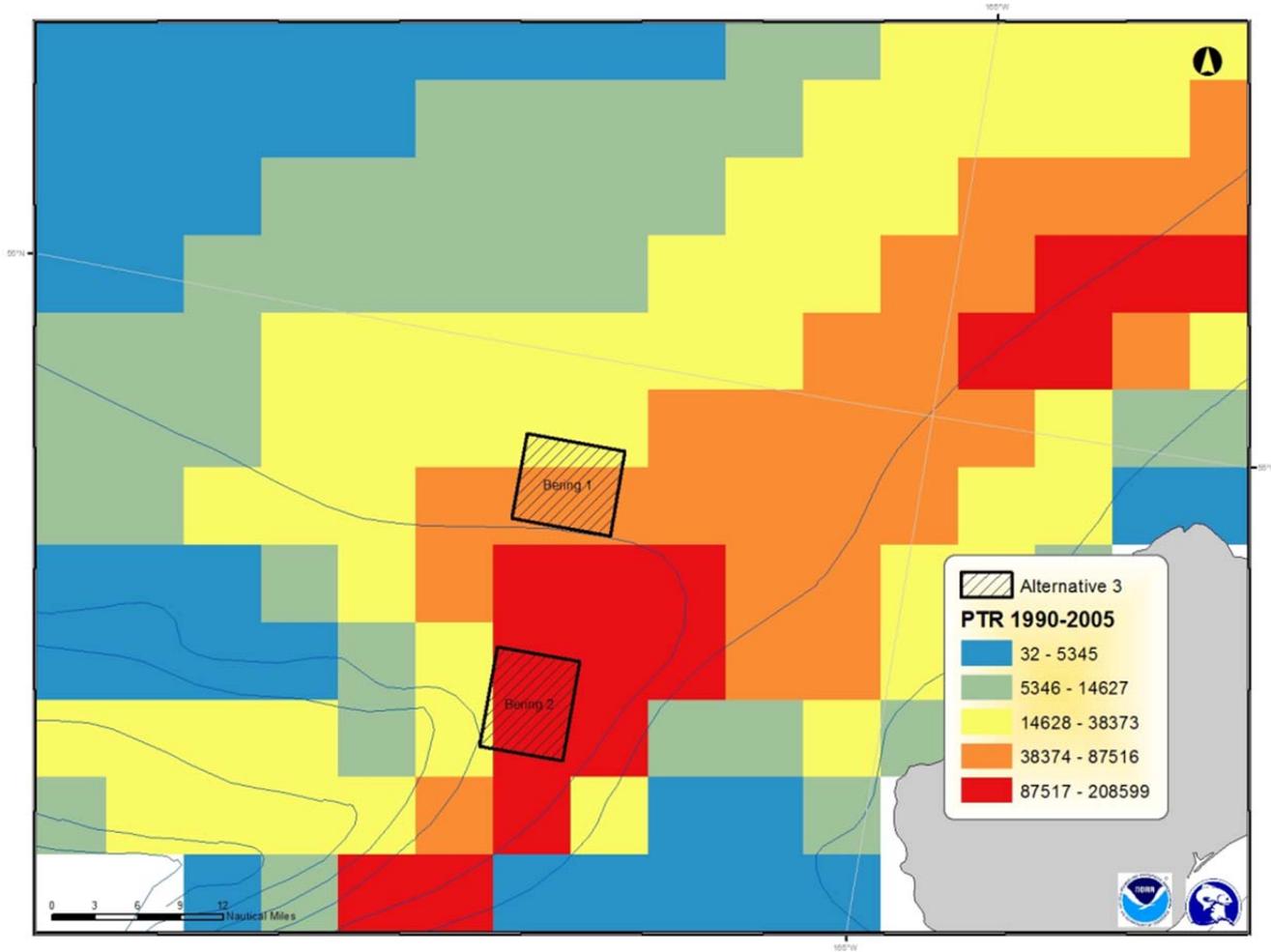
**Figure 32. Observed pelagic trawl (PTR) skate bycatch, CPUE from 2006 to 2011.**  
 (CPUE based on tows with observed skate bycatch only.)  
 Source: NMFS HCD.



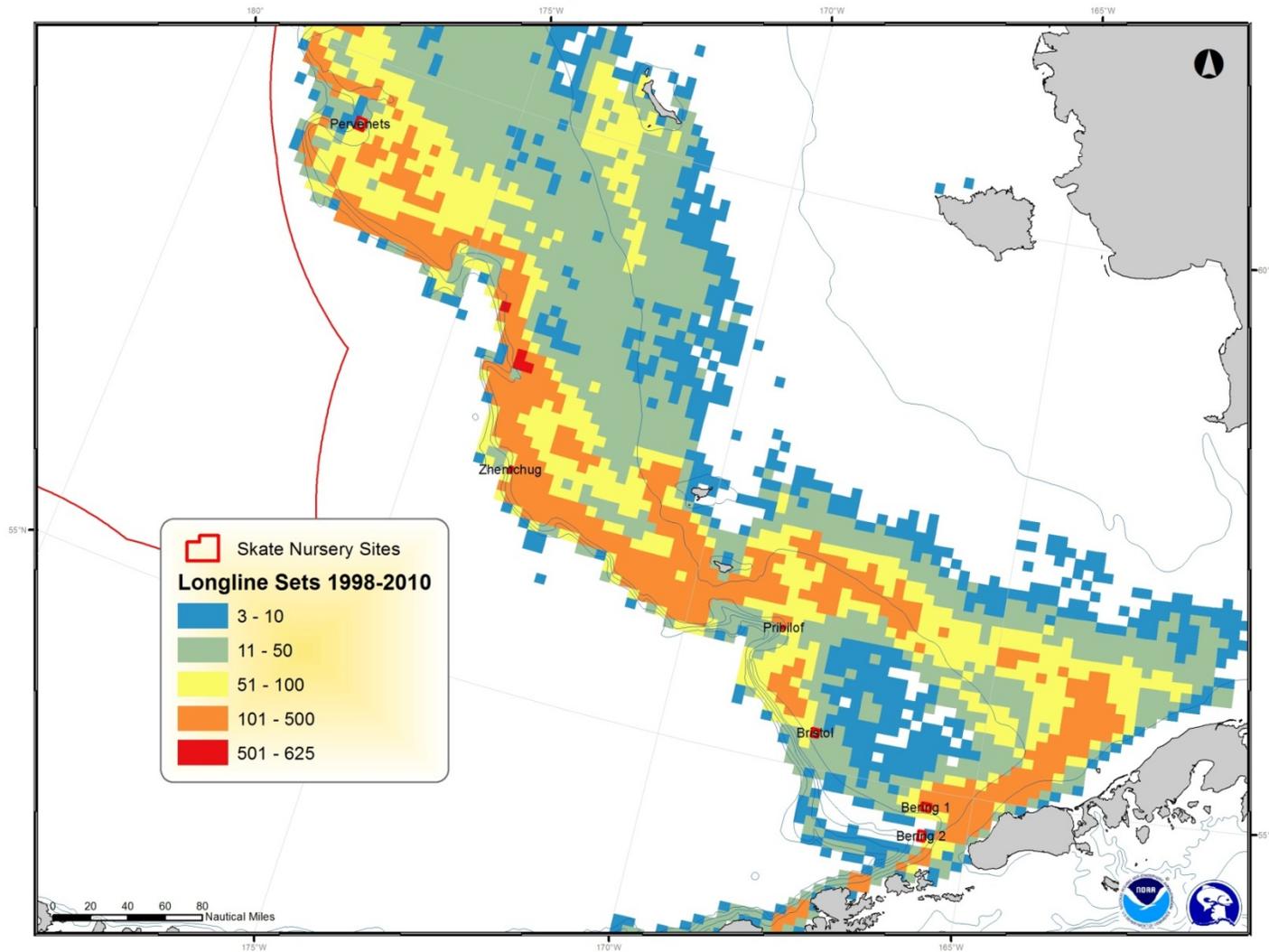
**Figure 33. Observed pelagic trawl (PTR) skate egg bycatch, CPUE from 1998 to 2011.**  
 (CPUE based on tows with observed skate egg bycatch only.)  
 Source: NMFS HCD.



**Figure 34. Observed pelagic trawl (PTR) skate egg bycatch, from 1998 to 2011, in extrapolated numbers.**  
 Source: NMFS HCD.

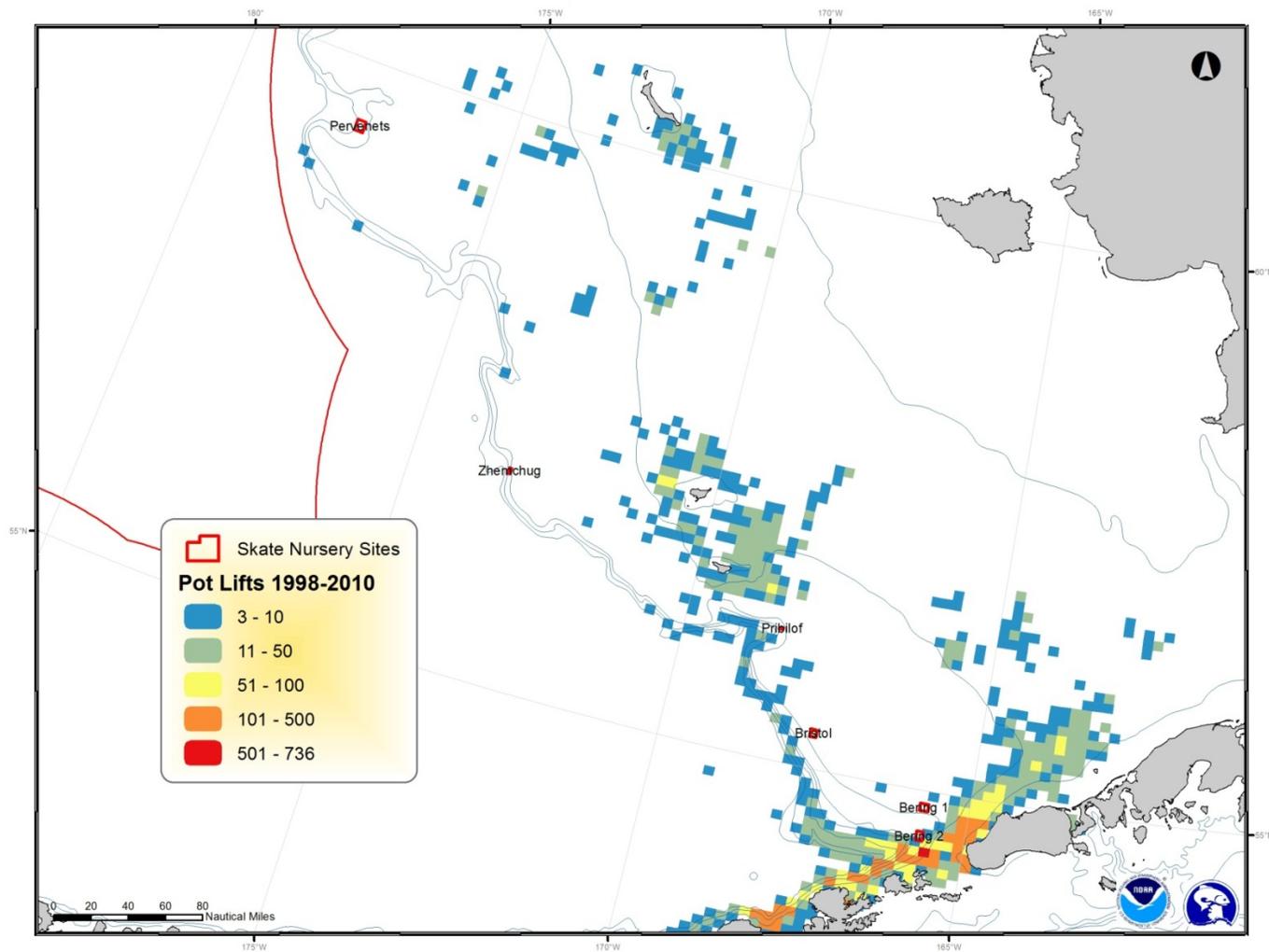


**Figure 35. Observed pelagic trawl (PTR), in tons of catch, from 1990 to 2005 for the Bering 1 and 2 HAPC sites under Alternative 3.**  
**Source: NMFS HCD.**



**Figure 36. Longline (hook and line) sets in the eastern Bering Sea, from 1998 to 2010.**  
 Source: NMFS HCD.

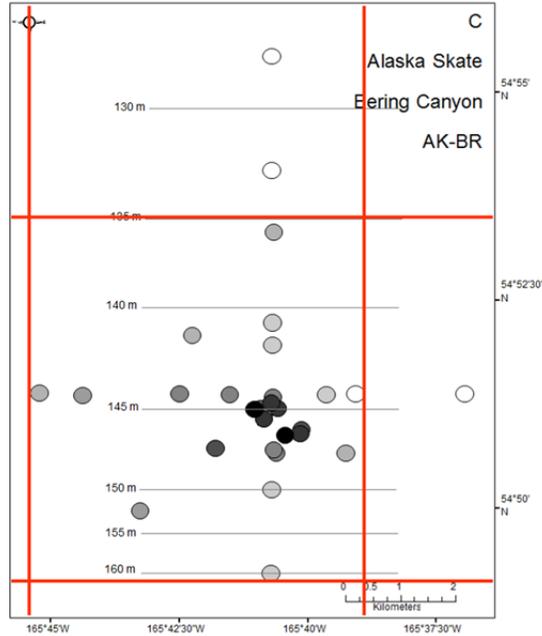




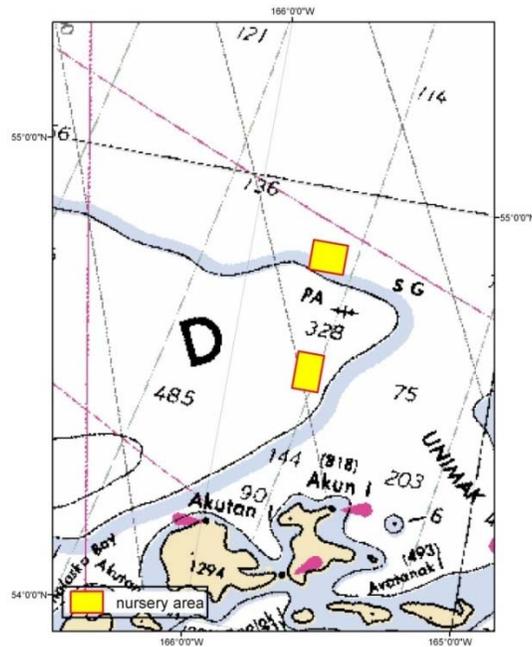
**Figure 38. Pot lifts in the eastern Bering Sea from 1998 to 2010.**  
**Source: NMFS HCD.**



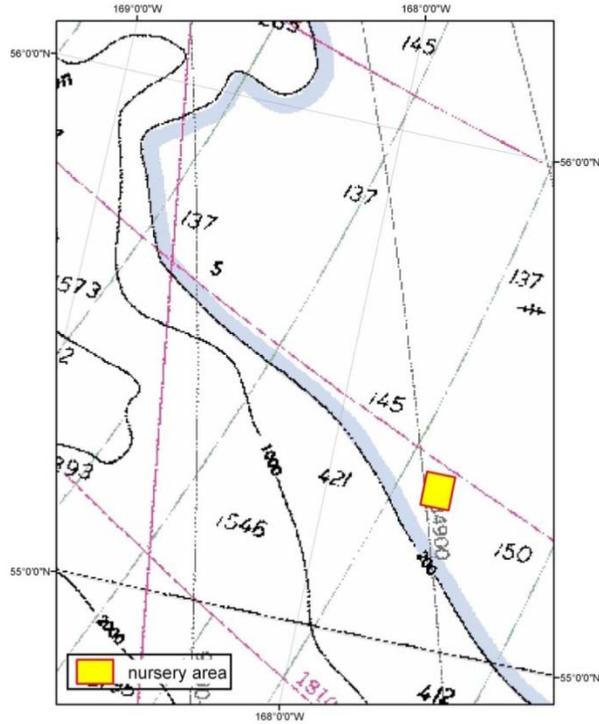
**Figure 39. Photograph of the seafloor in an area of skate egg concentration showing the seafloor within the site.  
Source: AFSC.**



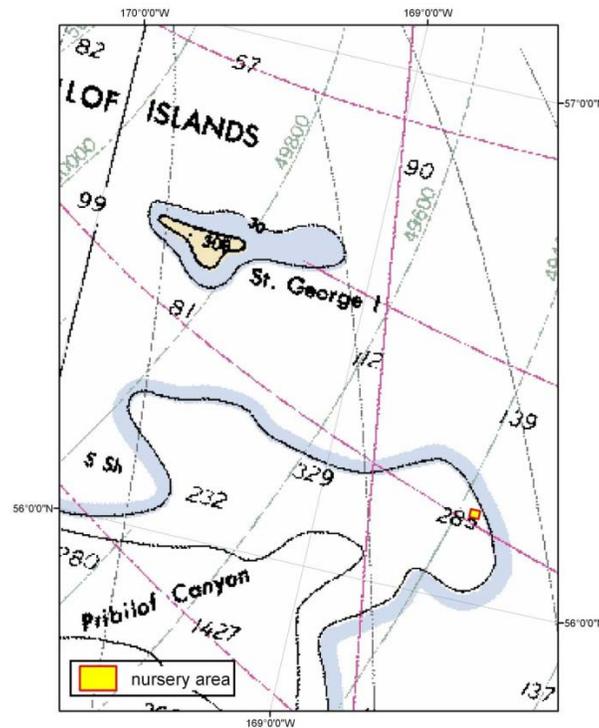
**Figure 40. Example of delineation of boundaries under Alternative 2. Red lines indicate extent of bottom trawls greater than 1,000 egg cases/ km<sup>2</sup>. Boundary lines were then snapped outward to next minute of latitude or longitude.**  
 Source: AFSC.



**Figure 41. Map detail of the Bering 1 and Bering 2 HAPC sites in the vicinity of the Bering Canyon under Alternative 2.**  
 Source: AFSC.

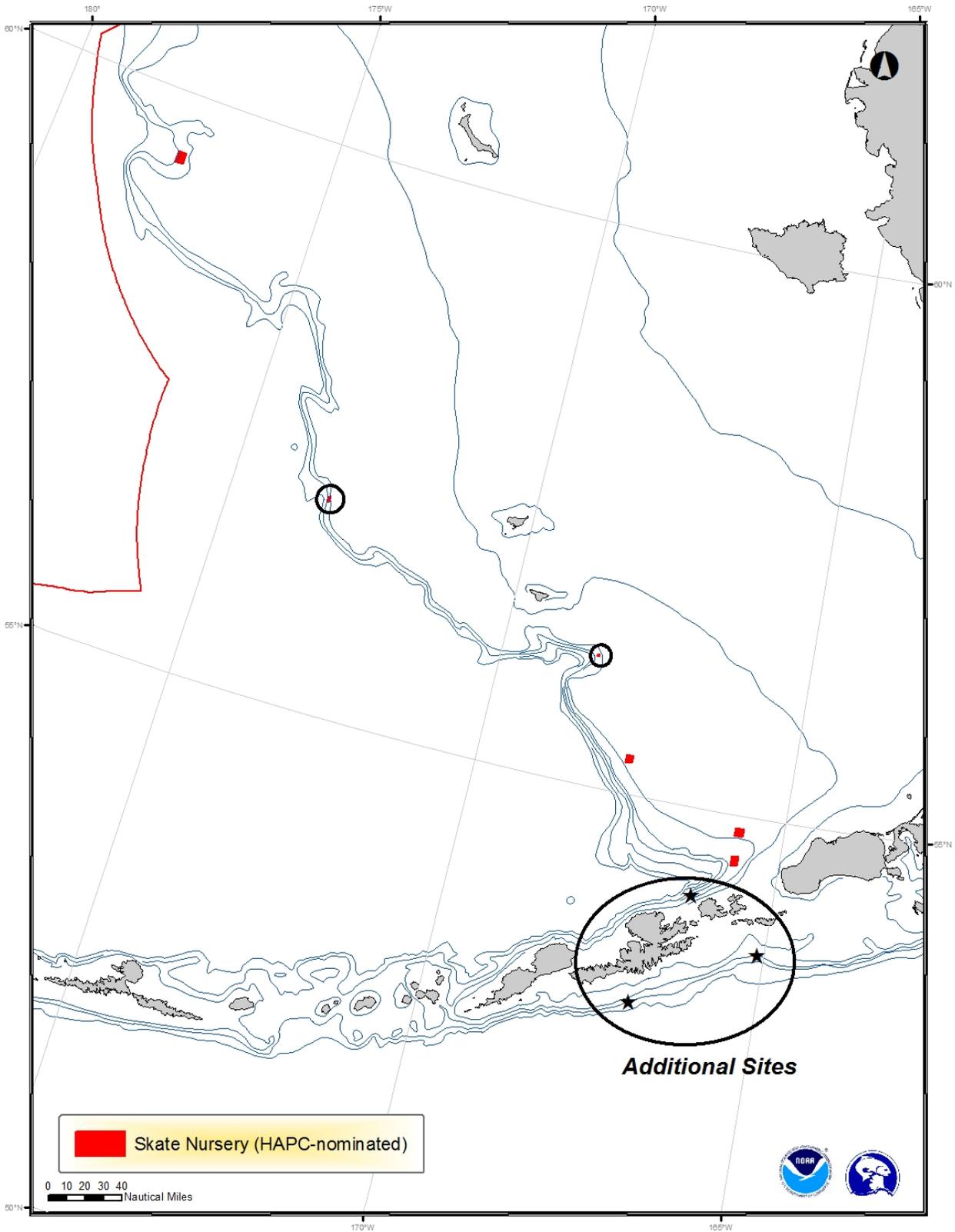


**Figure 42. Map detail of the Bristol HAPC site in the vicinity of the Bristol Canyon under Alternative 2.  
Source: AFSC.**

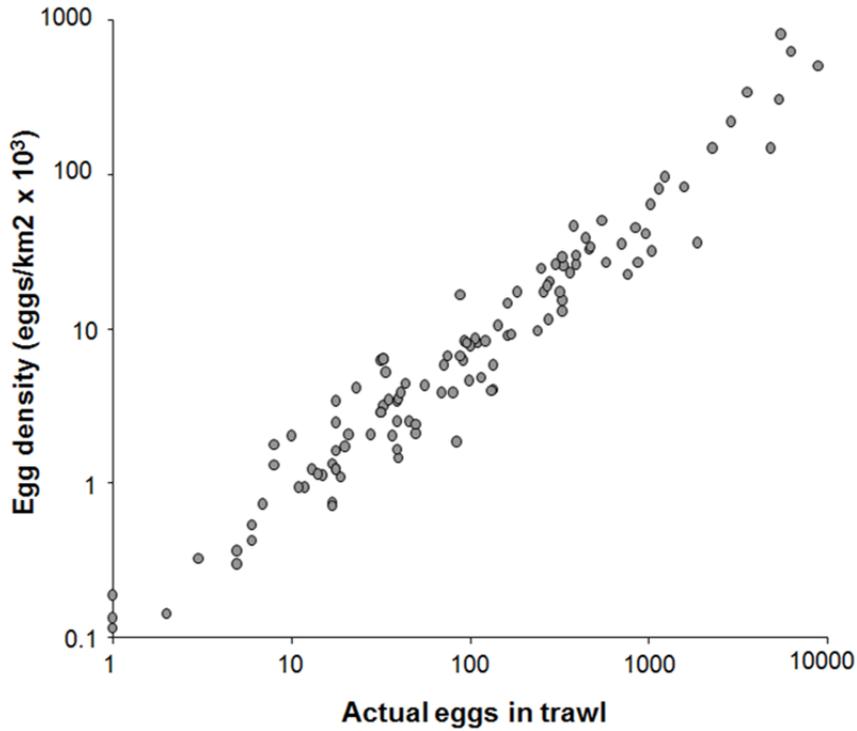


**Figure 43. Map detail of the Pribilof HAPC site in the vicinity of the Pribilof Canyon under Alternative 2.  
Source: AFSC.**

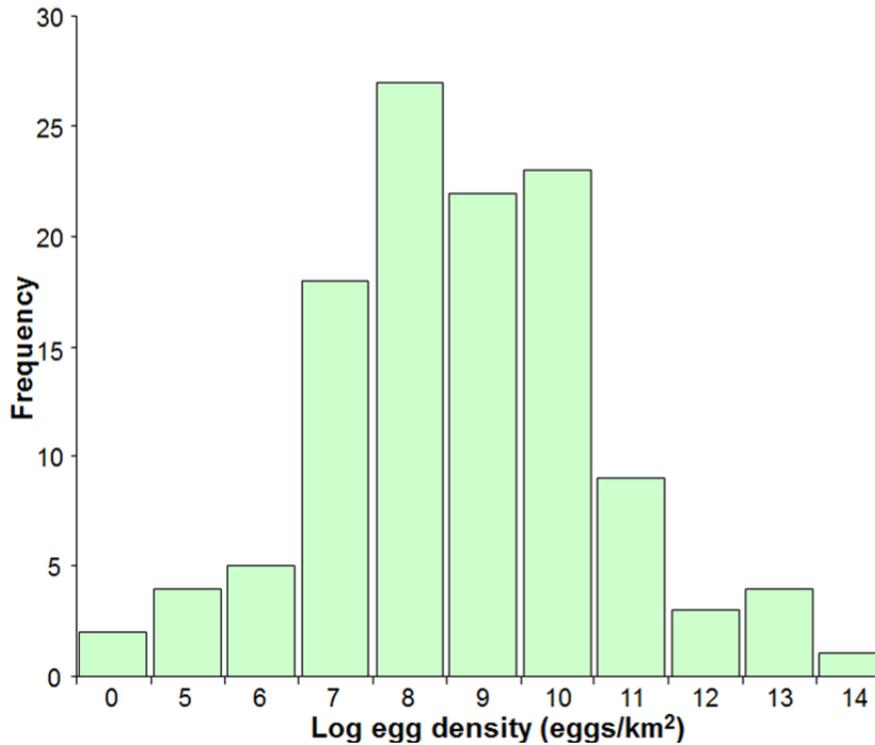




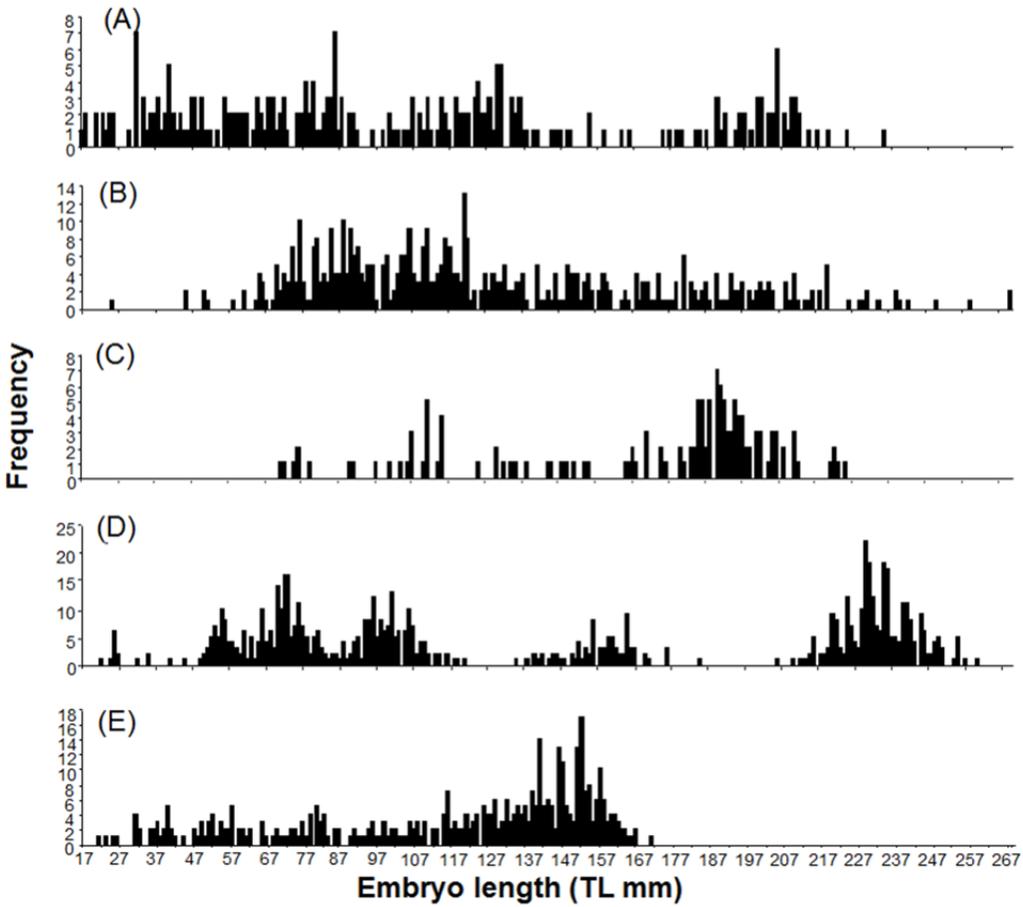
**Figure 46. Possible areas of skate egg concentration south of Bering 2 and in the Gulf of Alaska.**  
**Source: NMFS HCD.**



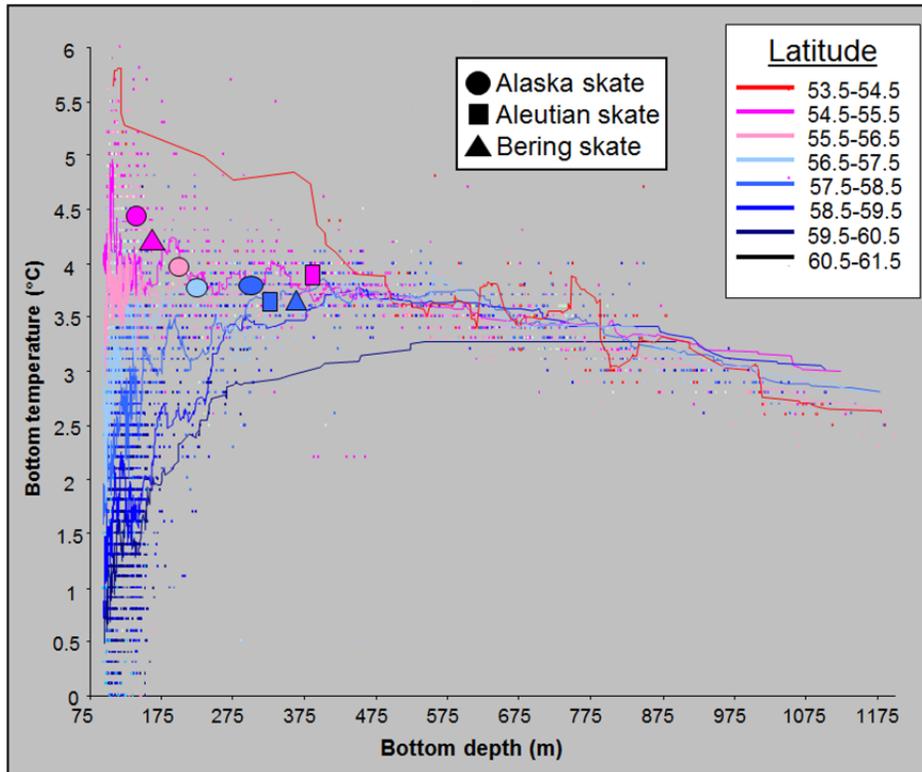
**Figure 47. Relationship between skate eggs encountered in the trawl and expansion to egg density.**  
 Source: AFSC.



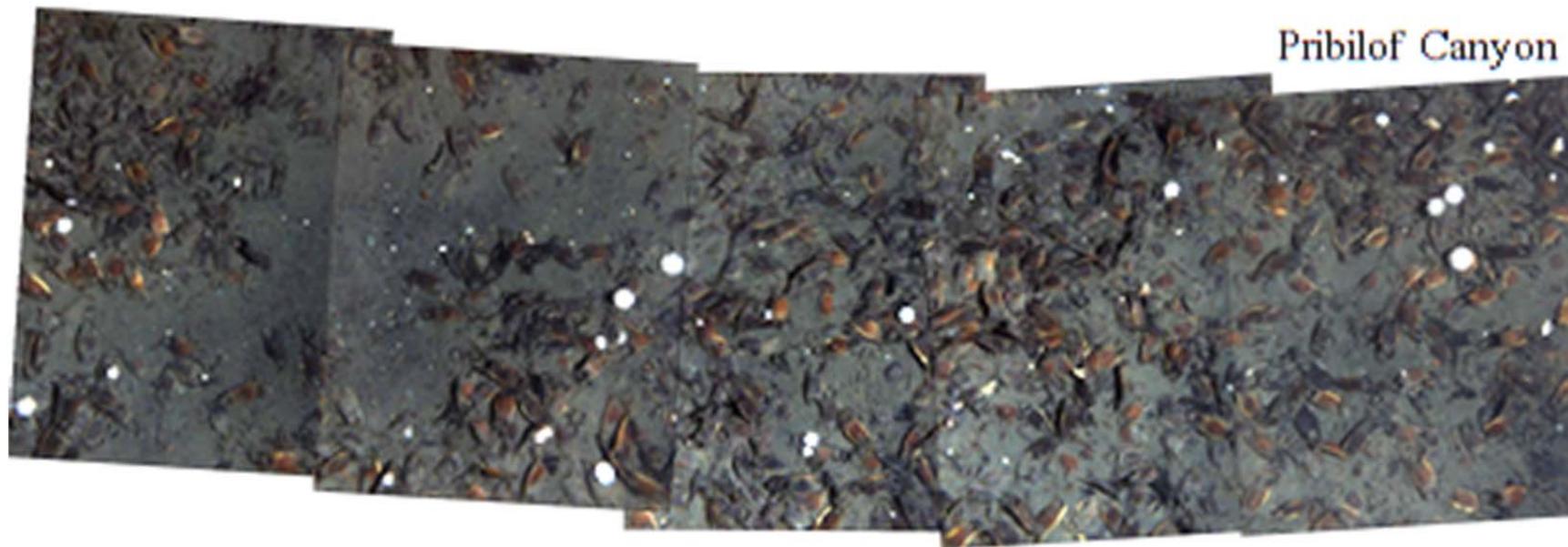
**Figure 48. Distribution of egg densities from all trawls in areas of skate egg concentration.**  
 Source: AFSC.



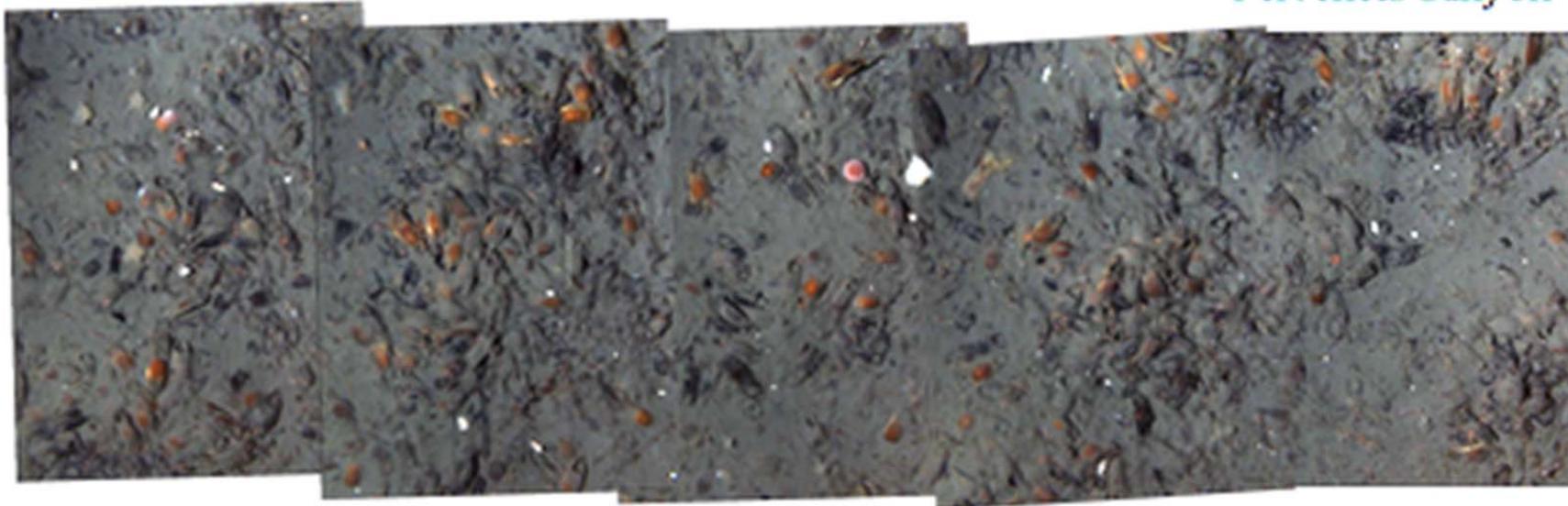
**Figure 49. Embryo length frequencies from five areas of skate egg concentration for three skate species in the eastern Bering Sea: A) the Alaska skate-Bering Canyon; B) the Alaska skate-Pervenets Canyon; C) the Aleutian skate-Bering Canyon; D) the Aleutian skate-Pervenets Canyon; and E) the Bering skate-Pervenets Canyon. Source: AFSC.**



**Figure 50. Depth temperature relationship with latitude in the eastern Bering Sea. Each line represents the running mean of that latitudes bottom temperature across the shelf and slope. Areas of skate egg concentration are plotted at their depth and mean temperature, symbol coded for species, and color coded for latitude.**  
**Source: AFSC.**



Pribilof Canyon



Pervenets Canyon

**Figure 51. Images of the seafloor within the areas of skate egg concentration in the Pribilof and Pervenets HAPC locations.**  
Source: AFSC.

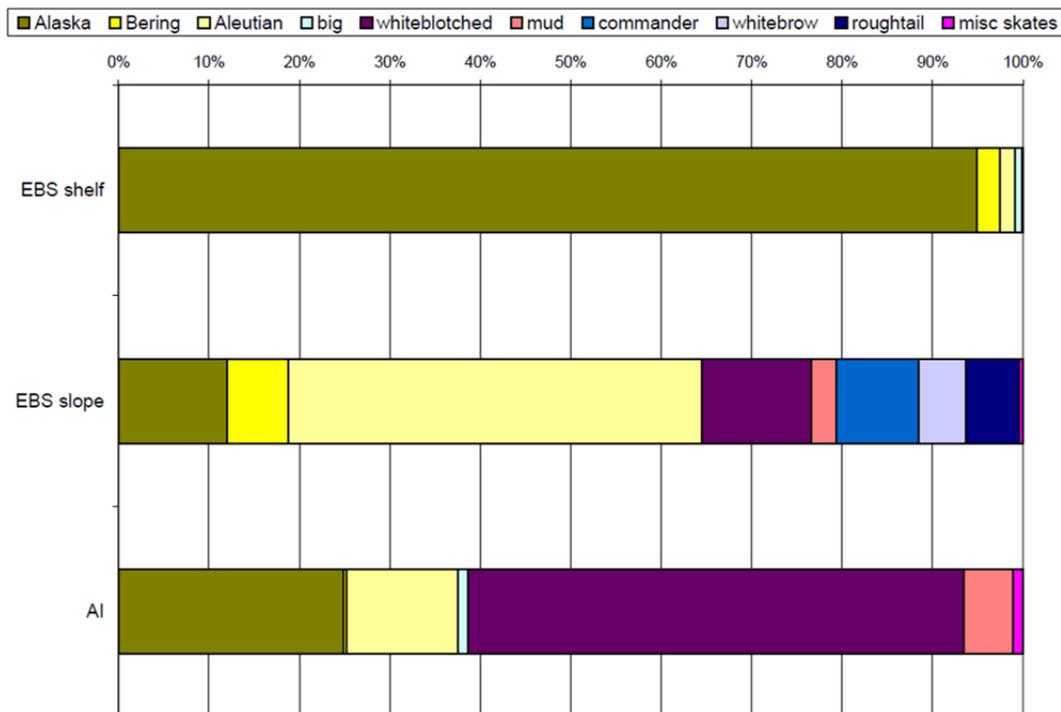


Figure 52. Skate species composition (by weight) by BSAI subregion, from surveys conducted in each region in 2010. “Misc skates” contains longnose, deepsea, and unidentified skates. Source: AFSC.

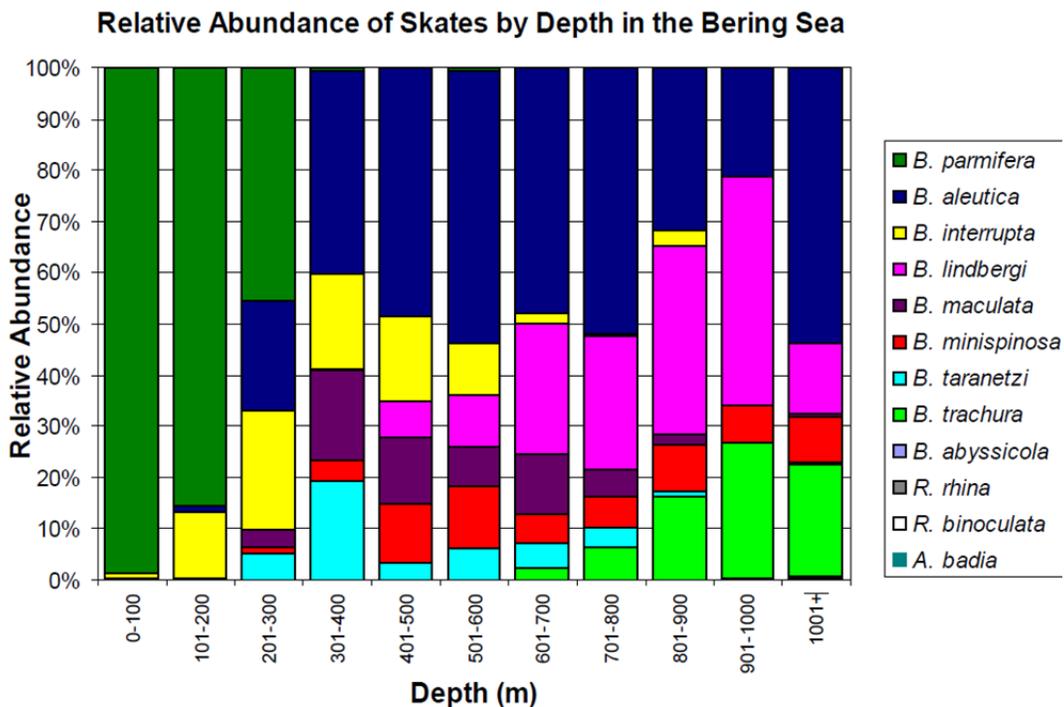
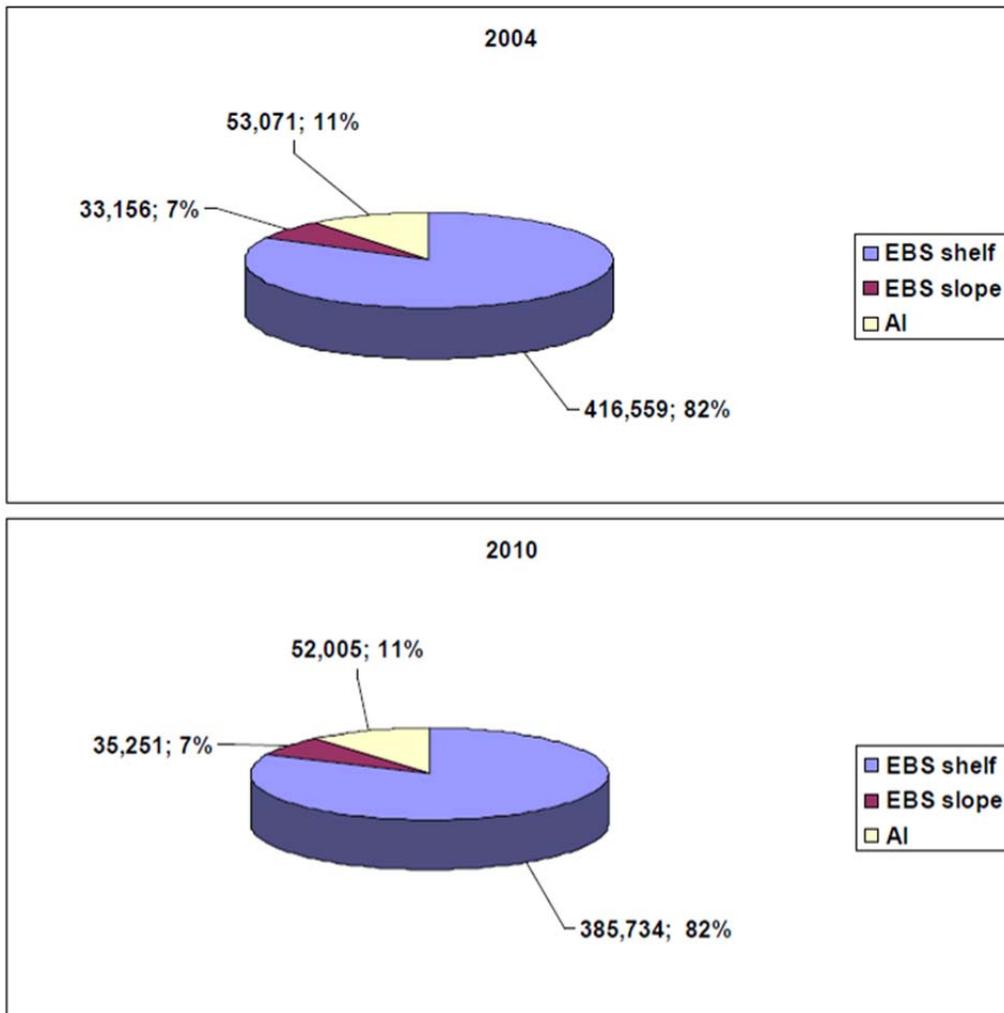
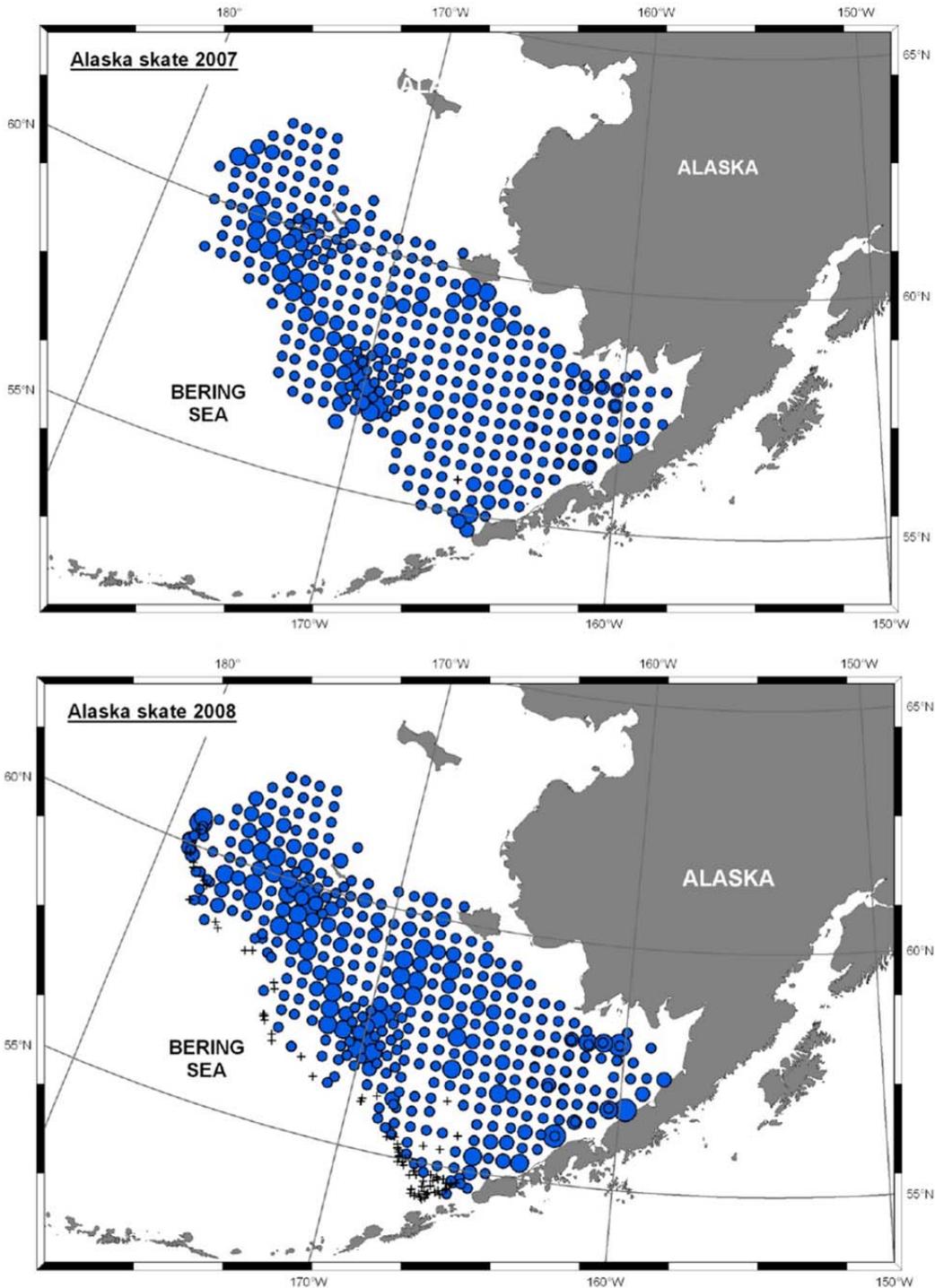


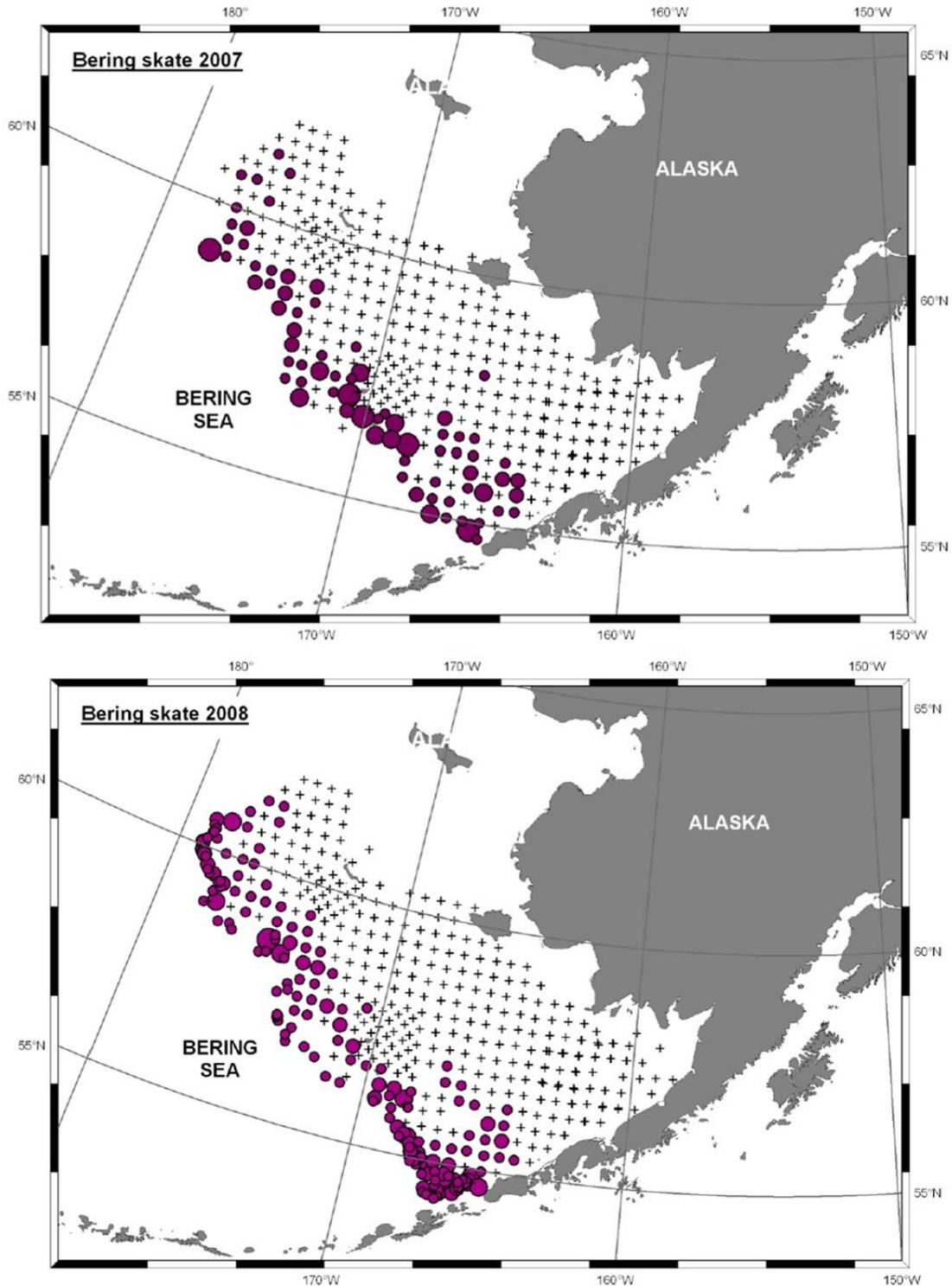
Figure 53. Relative abundance of skate species in the Bering Sea by depth. Source: Stevenson et al. 2006.



**Figure 54. Distribution of skate biomass in the three subregions of the BSAI (eastern Bering Sea shelf and slope, and the Aleutian Islands) from 2004 to 2010. Data are biomass estimates from the annual AFSC groundfish surveys. Source: AFSC and NPFMC.**



**Figure 55. AFSC bottom trawl survey catches of Alaska skate in 2007 and 2008. Symbol size is proportional to total catch at each survey station. Data from 2008 include the 2008 slope survey. Crosses indicate no catch of Alaska skate at that station. Source: AFSC.**



**Figure 56. AFSC bottom trawl survey catches of Bering skate in 2007 and 2008. Symbol size is proportional to total catch at each survey station. Data from 2008 include the 2008 slope survey. Crosses indicate no catch of Bering skate at that station. Source: AFSC.**

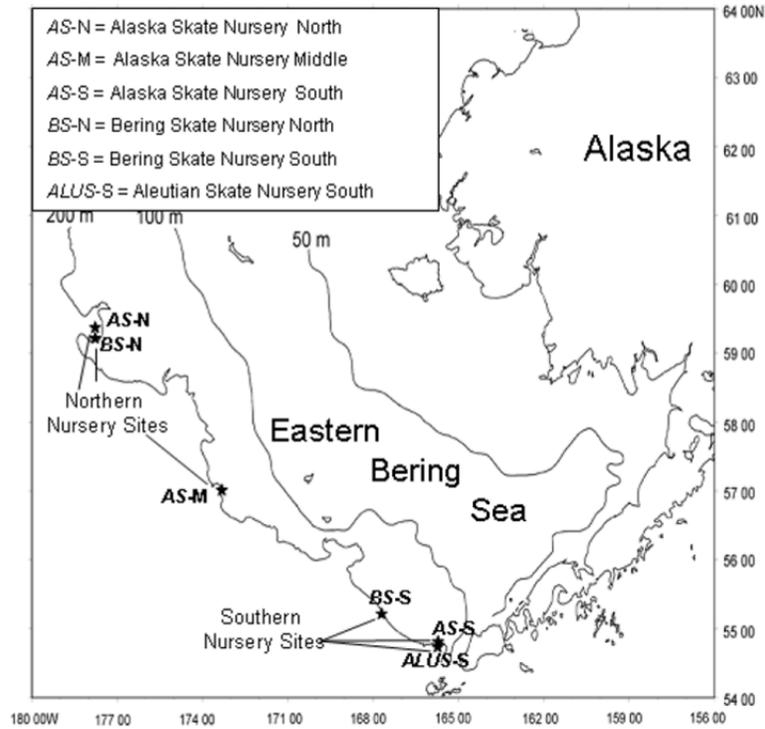


Figure 57. Map of the eastern Bering Sea with the six known areas of skate egg concentration and designations as a northern or southern nursery site. (See the legend for nursery site designation.)

Source: Gerald Hoff unpublished data.

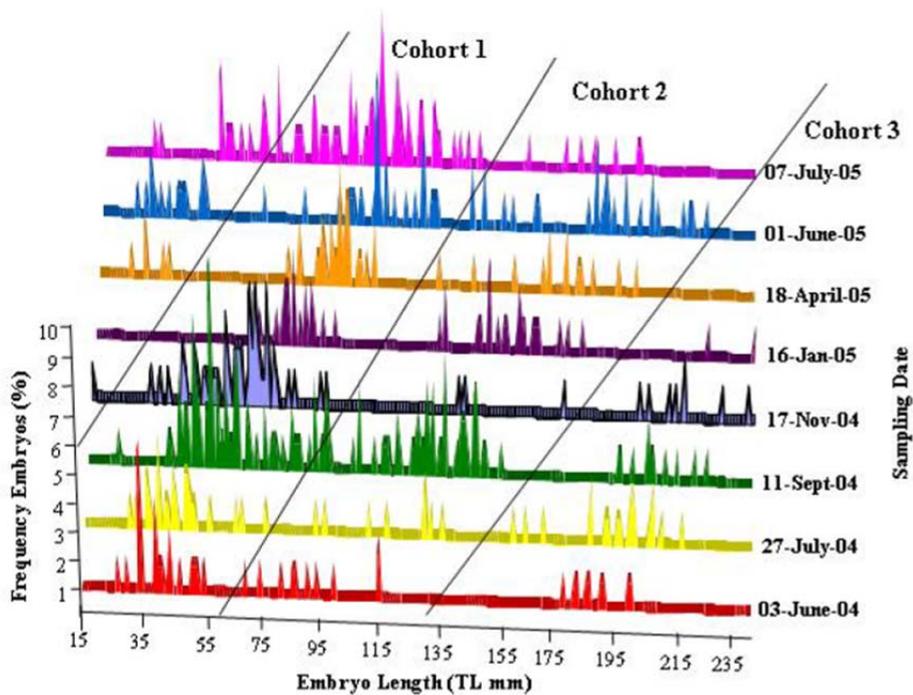


Figure 58. Embryo length composition data used in a cohort analysis of embryo development time. Source: AFSC.

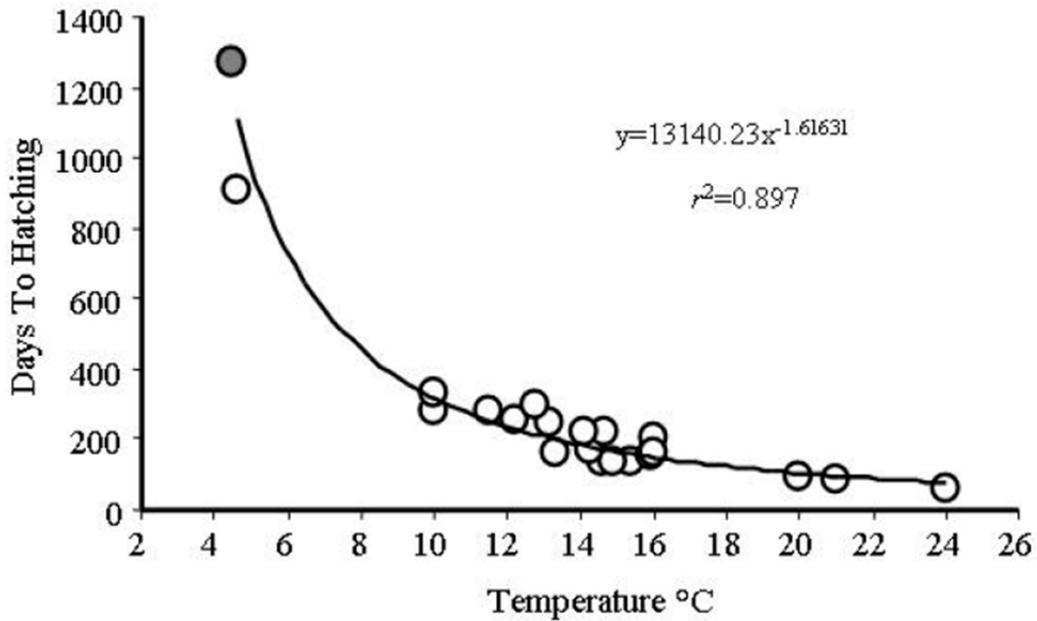


Figure 59. Ocean temperature versus embryo development time for 21 skate species. The shaded circle is the Alaska skate. Equation and  $r^2$  are the values of the fitted relationship. Source: AFSC.

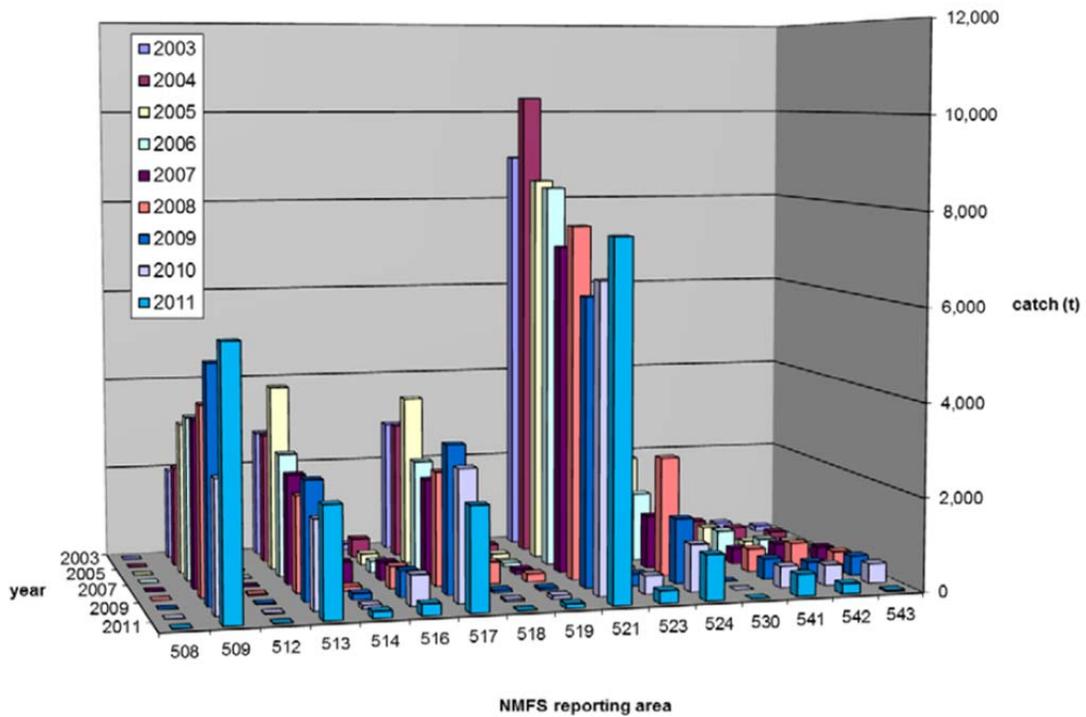
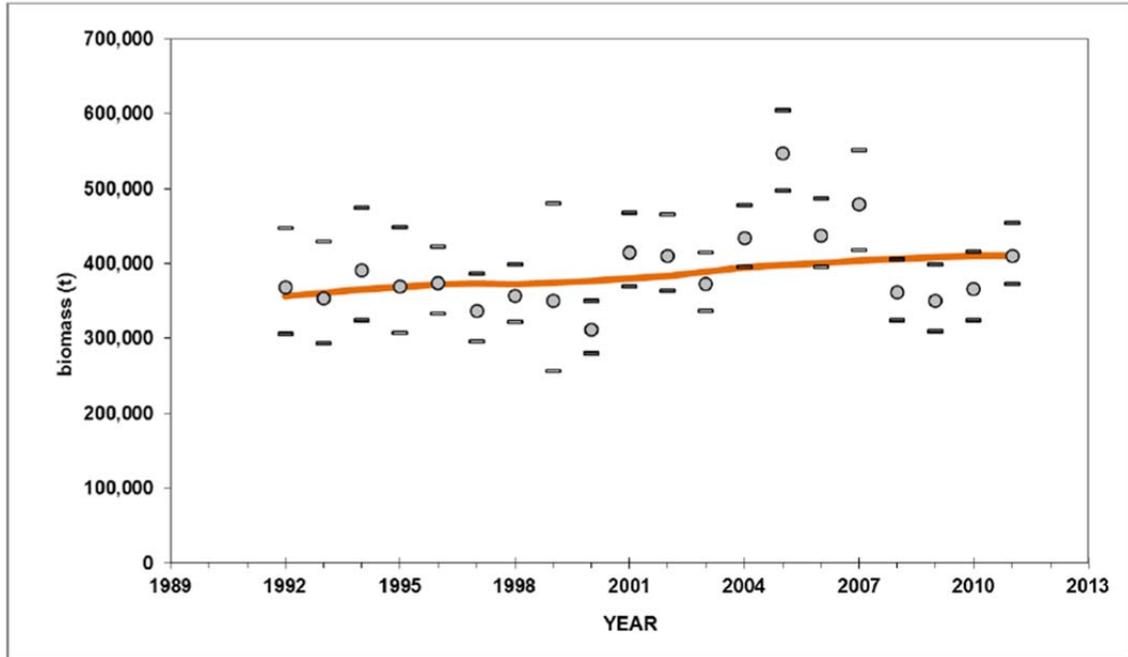
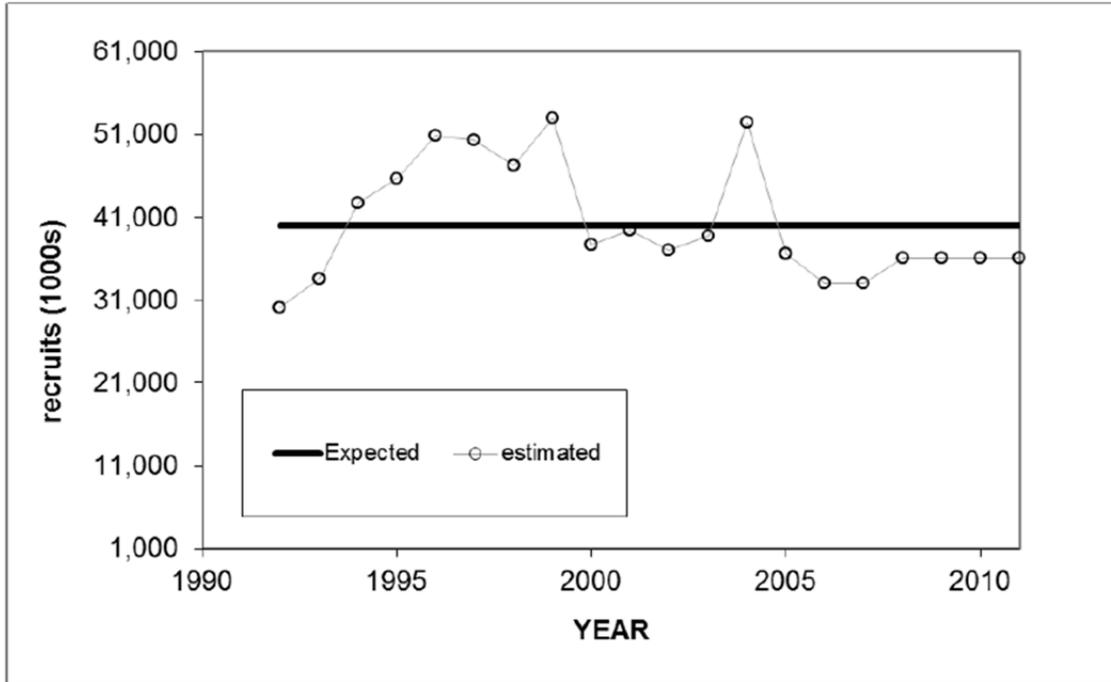


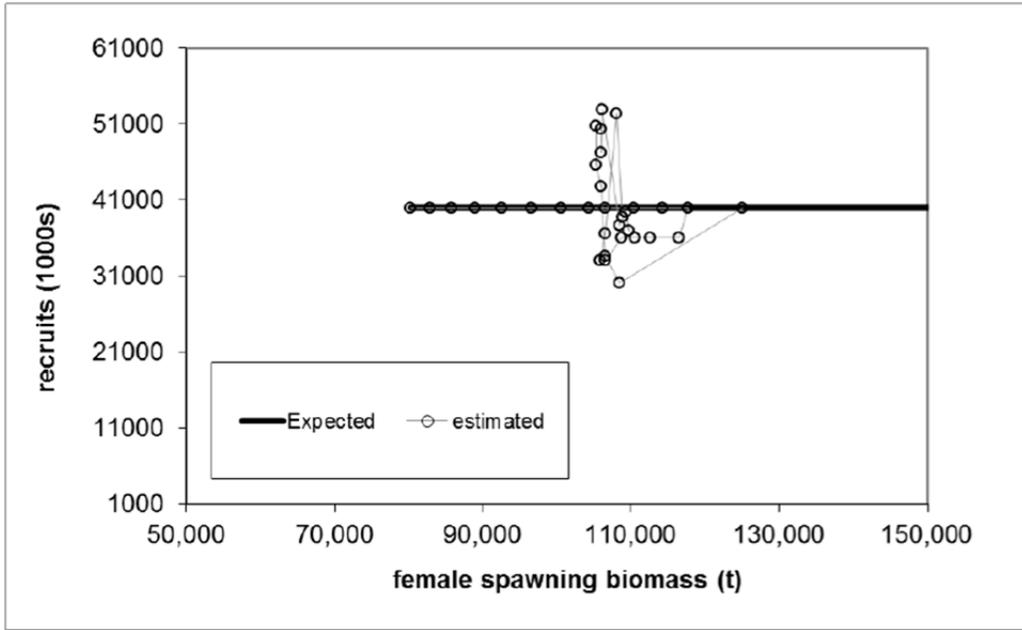
Figure 60. Total skate catch (all species combined) by FMP reporting area for both the eastern Bering Sea and the Aleutian Islands, from 2003 to 2011. Source: AKRO CAS. 2011 data incomplete; reported as of November 3, 2011.



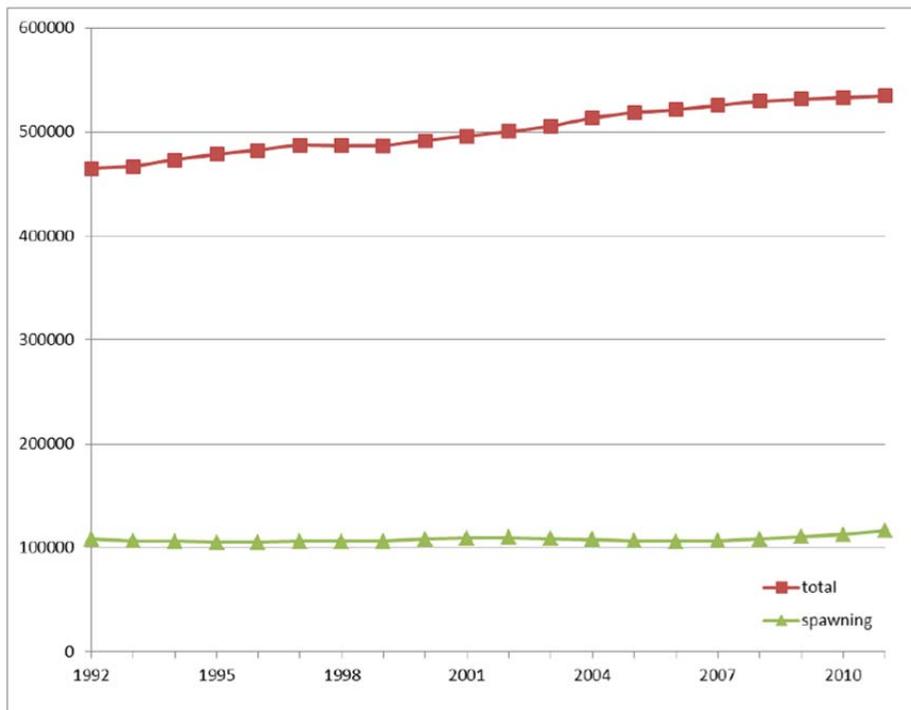
**Figure 61. Observed biomass (circles) from eastern Bering Sea shelf surveys from 1992 to 2011, with approximate confidence intervals ( $\pm 2$  SE), and predicted survey biomass from the model (orange line).  
Source: AFSC.**



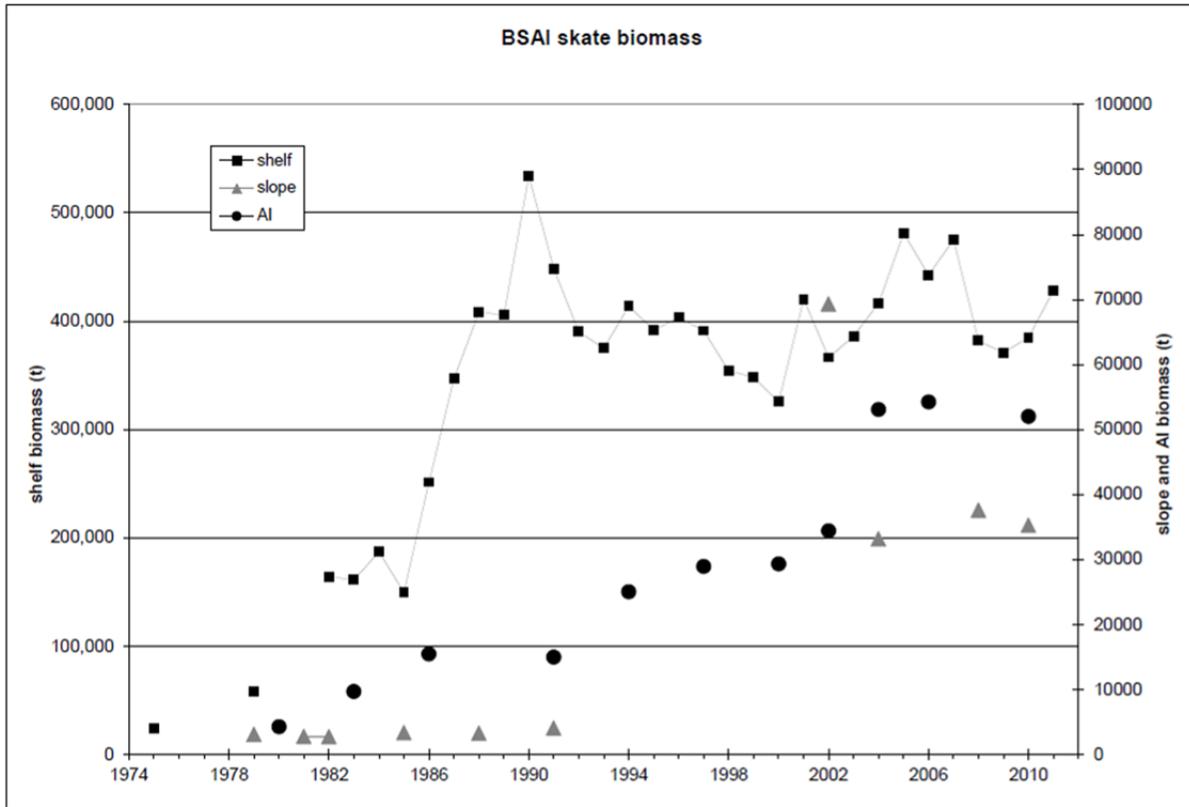
**Figure 62. Time series of expected recruitment (in thousands of age 0 fish), with the time series of individual year class estimates predicted by the model and the expected Beverton-Holt stock-recruit relationship with a steepness of 1.0.  
Source: AFSC.**



**Figure 63. Relationship between female spawning biomass (t) and the number of age 0 recruits (in thousands of fish). Time series of individual year class estimates from SS2 is shown with a Beverton-Holt stock-recruit relationship with a steepness of 1.0.**  
 Source: AFSC and NPFMC.



**Figure 64. Time series of model estimates for total (age 0+) biomass (t) and female spawning biomass (t).**  
 Source: AFSC.



**Figure 65. Aggregated skate biomass (mt) estimated from RACE bottom trawl surveys in each of the three major habitat areas in the eastern Bering Sea, from 1975 to 2011. Note that slope and AI estimates are much smaller and pertain to the secondary y-axis. Source: AFSC.**

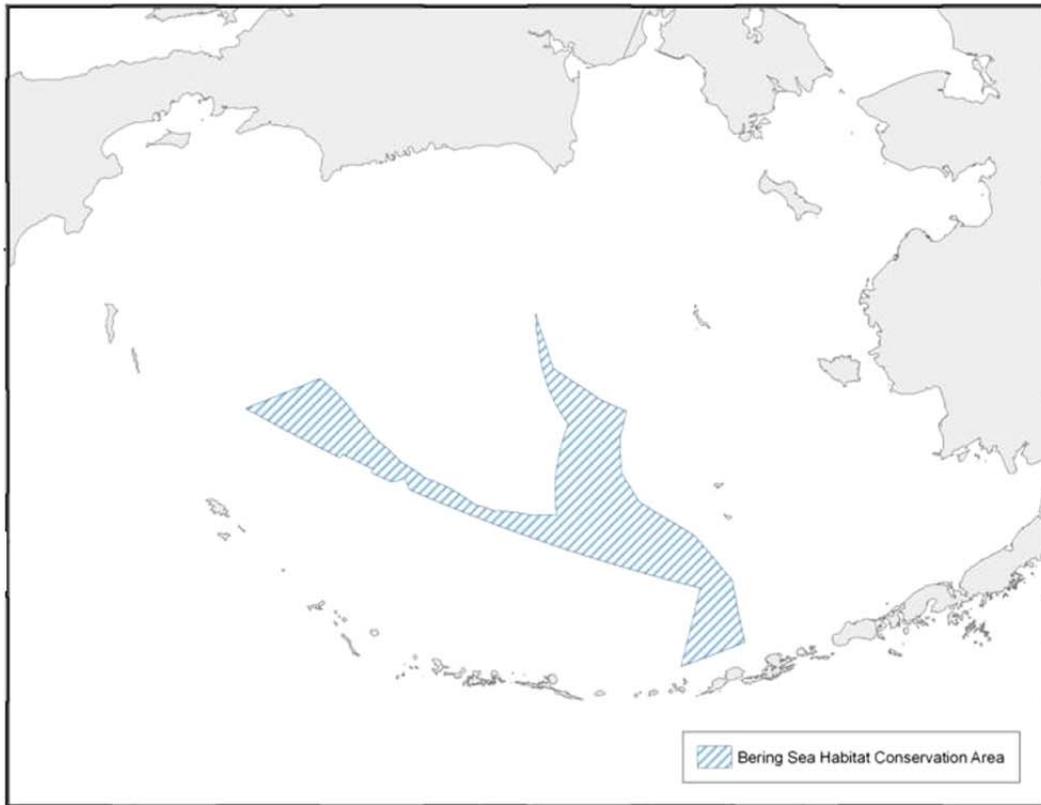


Figure 16 to Part 679--Bering Sea Habitat Conservation Area

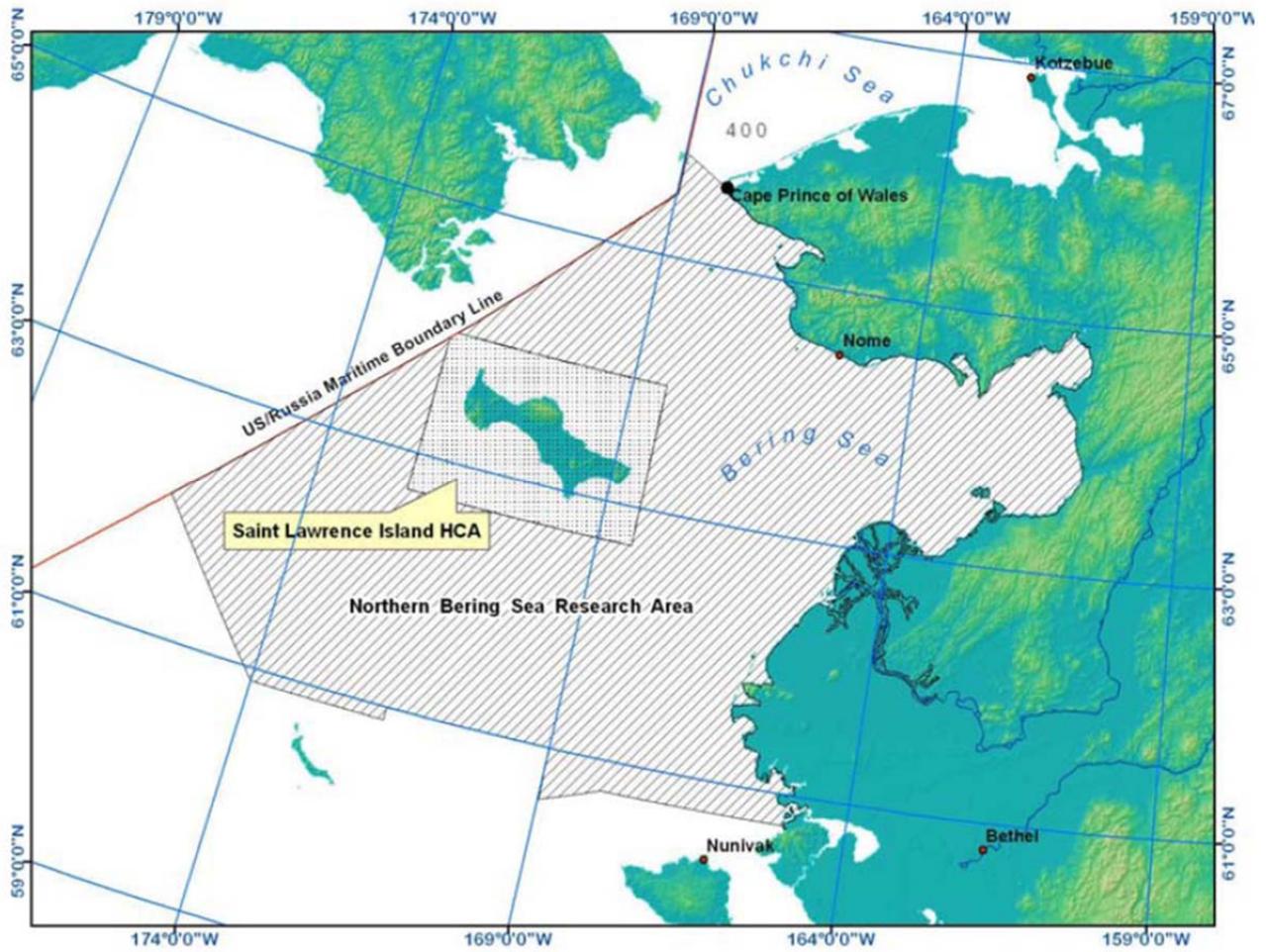
(Table 42 To Part 679. Bering Sea Habitat Conservation Area)	
Longitude/Latitude	
179° 19.95'W	59° 25.15'N
177° 51.76'W	58° 28.85'N
175° 36.52'W	58° 11.78'N
174° 32.36'W	58° 08.37'N
174° 26.33'W	57° 31.31'N
174° 00.82'W	56° 52.83'N
173° 00.71'W	56° 24.05'N
170° 40.32'W	56° 01.97'N
168° 56.63'W	55° 19.30'N

168° 00.08'W	54° 05.95'N
170° 00.00'W	53° 18.24'N
170° 00.00'W	55° 00.00'N
178° 46.69'E	55° 00.00'N
178° 27.25'E	55° 10.50'N
178° 06.48'E	55° 00.00'N
177° 15.00'E	55° 00.00'N
177° 15.00'E	55° 05.00'N
176° 00.00'E	55° 05.00'N
176° 00.00'E	55° 00.00'N
172° 06.35'E	55° 00.00'N
173° 59.70'E	56° 16.96'N

**Note:** The area is delineated by connecting the coordinates in the order listed by straight lines. The last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

**Figure 66. The Bering Sea Habitat Conservation Area in the standard format of the 50 CFR part 679 regulations: one graphic with a figure number to contain both the map and coordinates that describe the map.**

**Source:** NMFS



**Figure 67. The Northern Bering Sea Research and Saint Lawrence Island Habitat Conservation Areas (HCA) in the standard format of the 50 CFR part 679 regulations: one graphic with a figure number to contain both the map and coordinates that describe the map.**  
 Source: NMFS.

Figure 17 to Part 679 – Northern Bering Sea Research Area and Saint Lawrence Island Habitat Conservation Area (HCA)

Table 43 to Part 679 – Northern Bering Sea Research Area	
Longitude	Latitude
168°07.41 W	65°37.91 N*
165°01.54 W	60°45.54 N
167°59.98 W	60°45.55 N
169°00.00 W	60°35.50 N
169°00.00 W	61°00.00 N
171°45.00 W	61°00.00 N
171°45.00 W	60°54.00 N
174°01.24 W	60°54.00 N
176°13.51 W	62°06.56 N
172°24.00 W	63°57.03 N
172°24.00 W	62°42.00 N
168°24.00 W	62°42.00 N
168°24.00 W	64°00.00 N
172°17.42 W	64°00.01 N
168°58.62 W	65°30.00 N
168°58.62 W	65°49.81 N**

Table 45 To Part 679 -- St. Lawrence Island Habitat Conservation Area	
Longitude	Latitude
168° 24.00 W	64° 00.00 N
168° 24.00 W	62° 42.00 N
172° 24.00 W	62° 42.00 N
172° 24.00 W	63° 57.03 N
172° 17.42 W	64° 00.01 N

Table 43 Note: The area is delineated by connecting the coordinates in the order listed by straight lines except as noted by \* below. The last set of coordinates for the area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

\* This boundary extends in a clockwise direction from this set of geographic coordinates along the shoreline at mean lower-low tide line to the next set of coordinates.

\*\* Intersection of the 1990 United States/Russia maritime boundary line and a line from Cape Prince of Wales to Cape Dezhneva (Russia) that defines the boundary between the Chukchi and Bering Seas, Area 400 and Area 514, respectively.

**Figure 68. The Northern Bering Sea Research and Saint Lawrence Island Habitat Conservation Areas (HCA) in the standard format of the 50 CFR part 679 regulations: one graphic with a figure number to contain both the map and coordinates that describe the map.**

Source: NMFS. Text in blue was updated January 20, 2011.

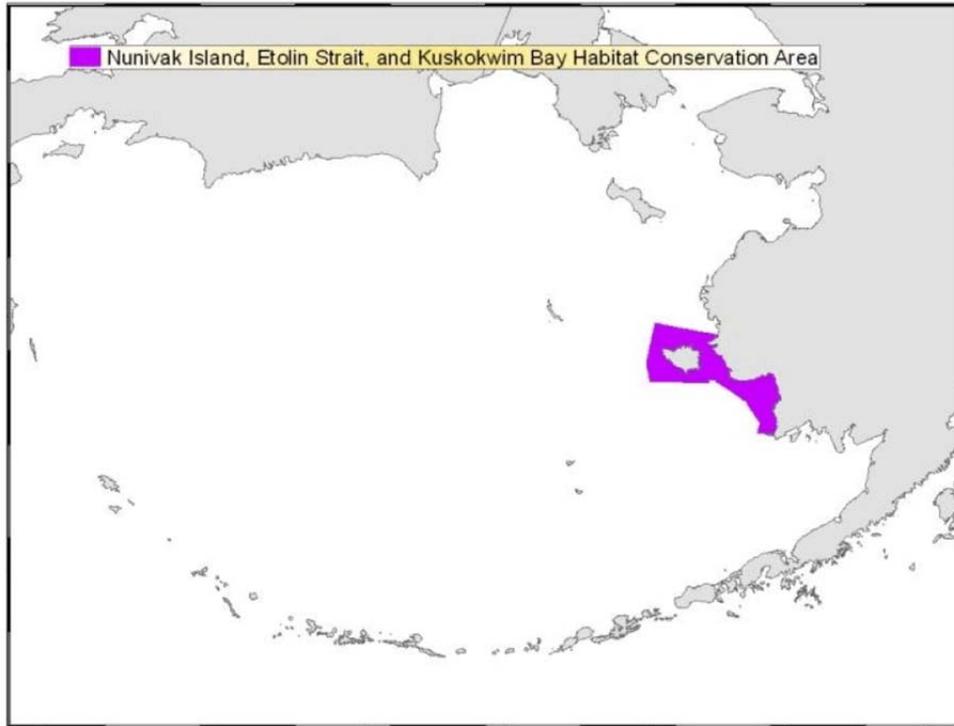


Figure 21 to Part 679--Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area

(Table 44 To Part 679—Nunivak Island, Etolin Strait, And Kuskokwim Bay Habitat Conservation Area)	
Longitude/Latitude	
165 1.54W	60 45.54N*
162 7.01W	58 38.27N
162 10.51W	58 38.35N
162 34.31W	58 38.36N
162 34.32W	58 39.16N
162 34.23W	58 40.48N
162 34.09W	58 41.79N
162 33.91W	58 43.08N
162 33.63W	58 44.41N
162 33.32W	58 45.62N

162 32.93W	58 46.80N
162 32.44W	58 48.11N
162 31.95W	58 49.22N
162 31.33W	58 50.43N
162 30.83W	58 51.42N
162 30.57W	58 51.97N
163 17.72W	59 20.16N
164 11.01W	59 34.15N
164 42.00W	59 41.80N
165 0.00W	59 42.60N
165 1.45W	59 37.39N
167 40.20W	59 24.47N
168 0.00W	59 49.13N
167 59.98W	60 45.55N

**Note:** The area is delineated by connecting the coordinates in the order listed by straight lines, except as noted by \* below. The last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

\* This boundary extends in a clockwise direction from this set of geographic coordinates along the shoreline at mean lower-low tide line to the next set of coordinates.

**Figure 69. Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area under standard format of the 50 CFR part 679 regulations: one graphic with a figure number to contain both the (a) map and the (b) coordinates that describe the map.**

Source: NMFS.